Nokia Customer Care

Service Manual

RM-414 (Nokia 6600 slide; L3&4)
Mobile Terminal

Part No: (Issue 1)

COMPANY CONFIDENTIAL

NOKIA
Care

Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	07/2008	LB	

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The availability of particular products may vary by region.

IMPORTANT

This document is intended for use by qualified service personnel only.

Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/ MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- Never test a mobile phone WCDMA transmitter with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.
- During testing never activate the GSM or WCDMA transmitter without a proper antenna load, otherwise GSM or WCDMA PA may be damaged.

For your safety

QUALIFIED SERVICE

Only qualified personnel may install or repair phone equipment.

ACCESSORIES AND BATTERIES

Use only approved accessories and batteries. Do not connect incompatible products.

CONNECTING TO OTHER DEVICES

When connecting to any other device, read its user’s guide for detailed safety instructions. Do not connect incompatible products.

Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

Battery information

Note: A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Li-Ion batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77°F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

Company Policy

Our policy is of continuous development; details of all technical modifications will be included with service bulletins.

While every endeavour has been made to ensure the accuracy of this document, some errors may exist. If any errors are found by the reader, NOKIA MOBILE PHONES Business Group should be notified in writing/e-mail.

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Nokia 6600 slide; L3&4 Service Manual Structure

1 General information
2 Service Devices and Service Concepts
3 BB Troubleshooting and Manual Tuning Guide
4 RF troubleshooting
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Glossary

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1 — General information

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Product selection

RM-414 (Nokia 6600 slide) is a GSM/WCDMA dual mode phone, supporting EGSM850/900/1800/1900 and WCDMA bands I and V.

Figure 1 RM-414 (Nokia 6600 slide) product picture

Phone features

Display and keypad features

- 2.2" TFT display with 320 x 240 pixels and 16M colors
- Accelerometer for tap commands
- Indicator light for missed events, low battery, etc.
- 5-way Navi key (Soft keys, call and end keys)

Hardware features

- 3.2 megapixel camera with 8x zoom and double LED flash
- Secondary VGA camera for video calls
- Micro USB port for data transfer with USB 2.0 (full speed), charging and headset
- 2 mm charger plug interface
- Bluetooth version 2.0
- 20 MB internal user memory and 512MB microSD card
- Stereo Music Player, FM radio in stereo headset (inbox)
- Internal vibra and antenna
- Plug-in SIM (1.8 V and 3.0 V)

RF features

- GSM/EDGE 850/900/1800/1900
- WCDMA band I and V
- EDGE Rel. 4: MSC 32
- GPRS: MSC 32
- CSD for browsing and as data modem

Software and user interface features

Selection of software application and features

- Video streaming
- SAIC
- Themes, wallpapers, skins
- OMA DRM 1.0 and 2.0 (Digital Rights Management
- WMDRM (Windows Media)
- OMA MMS 1.3, MMS Conformance 3.0, AMR, SMIL
- OMA Client Provisioning v1.1
- Audio messaging
- Email client (native): IMAP4, POP3, SMTP
- Java
- Macromedia Flash Lite 3.0
- Video, MP3, AAC and 64 polyphonic ringing tones
- Music Player supporting MP3, AAC, AAC+, eAAC+, WMA
- WAP 2.0
- XHTML browser over HTTP/TCP/IP stack
- OMA SyncML 1.1.2 (local)
- OTA download of ringing tones, themes, wallpapers
- Download/upload of images and video sequences
- OMA DM 1.2 and FOTA with FUMO 1.0
- Nokia Maps, Widsets, Mobile Search, Yahoo! Go, Windows Live, Download!, Opera Mini browser

Accessories

Sales package contents

- Nokia 6600 slide phone
- Nokia Battery BL-4U
- Nokia Travel Charger AC-4
- Nokia Wired Headset WH-501 (AD-83 + HS-83)
- Nokia Micro SD Memory card MU-28, 512 MB
- Nokia Micro USB Cable CA-101
- User Guide

Table 1 Battery and chargers

Type	Name
Note: This phone is charged through the smaller Nokia standard charger interface (2.0 mm plug). A 3.5 mm compatible Nokia standard charger can be used together with the CA-44 charger adapter.	
BL-4U	Battery 1000 mAh Li-Ion
AC-4	Travel charger

Table 2 Car accessories

Type	Name
CK-15W	Bluetooth display car kit
HF-9W	Dashboard/sunvisor with display
DC-4	Mobile charger
DC-6	Mobile charger (micro USB)

Table 3 Headsets

Type	Name
Wired	
WH-501 (AD-83 + HS-83)	Wired headset with built-in FM radio
Wireless	
BH-803	Bluetooth headset

Table 4 Music

Type	Name
MD-5W	Bluetooth stereo speakers with handsfree
AD-42W	Wireless audio gateway

Table 5 Navigation

Type	Name
LD-4W	Bluetooth GPS module

Table 6 Memory cards

Type	Name
MU-28	512 MB microSD card
MU-22	1 GB microSD card
MU-37	2 GB microSD card
MU-41	4 GB microSD card

Table 7 Data cables

Type	Name
CA-101	Micro USB cable

Technical specifications

General specifications

Unit	Dimension (mm)	Weight (g)	Volume (cc)
RM-414 Transceiver with BL-4U 1000 mAh Li-Ion battery pack	93 x 45 x 14.15	110	52

Main RF characteristics for GSM850/900/1800/1900 and WCDMA band I/V phones

Parameter	Unit
Cellular system	GSM850, EGSM900, GSM1800/1900, WCDMA V and WCDMA I
Rx frequency band	GSM850: 869 - 894 MHz
	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA I (2100): 2110 - 2170 MHz
	WCDMA V (850): 871 - 892 MHz
Tx frequency band	GSM850: 824 - 849 MHz
	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA I (2100): 1920 - 1980 MHz
	WCDMA V (850): 826 - 847 MHz
Output power	GSM850: +5 ...+33dBm/3.2mW ... 2W
	GSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
	WCDMA I (2100): -50 ... +21 dBm/0.01μW ... 251.2mW
	WCDMA V (850): -50 ... +21 dBm/0.01μW ... 251.2mW
Number of RF channels	GSM850: 124
	GSM900: 174
	GSM1800: 374
	GSM1900: 299
	WCDMA I (2100): 277
	WCDMA V (850): 108

Parameter	Unit
Channel spacing	200 kHz
Number of Tx power levels	GSM850: 15
	GSM900: 15
	GSM1800: 16
	GSM1900: 16
	WCDMA I (2100): 75
	WCDMA V (850): 75

Battery endurance

Battery	Talk time	Standby time
BL-4U 1000 mAh Li-ion	GSM: up to 4 hours WCDMA: up to 3 hours	GSM: 350 hours WCDMA: 300 hours

Note: Variation in operation times will occur depending on SIM card, network settings and usage. Talk time is increased by up to 30% if half rate is active, and reduced by 5% if enhanced full rate is active.

Environmental conditions

Environmental condition	Ambient temperature	Notes
Normal operation	-15 ºC ... +55 ºC	Specifications fulfilled
Reduced performance	55 ºC ... +70 ºC	Operational only for short periods
Intermittent or no operation	-40 ºC ... -15 ºC and +70 ºC ... +85ºC	Operation not guaranteed but an attempt to operate will not damage the phone
No operation or storage	<-40 ºC and >+85 ºC	No storage. An attempt to operate may cause permanent damage
Charging allowed	-15 ºC ... +55 ºC	
Long term storage conditions	0 ºC ... +85 ºC	
Humidity and water resistance		Relative humidity range is 5 to 95%. Condensed or dripping water may cause intermittent malfunctions. Protection against dripping water has to be implemented in (enclosure) mechanics. Continuous dampness will cause permanent damage to the module.

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2 — Service Devices and Service Concepts

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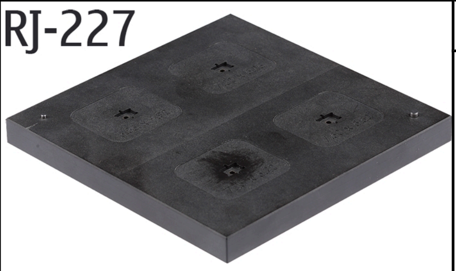
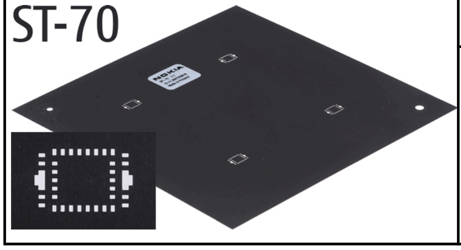
Service devices

Product specific devices

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-414. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

	FS-87	Flash adapter	
	• FS-87 is equipped with a clip interlock system • provides standardised interface towards Control Unit • provides RF connection using coupler • multiplexing between USB and FBUS media, controlled by VUSB **Note:** FS-87 **must not** be used for EM-calibration.		
	MJ-183	Module jig	
	MJ-183 is meant for component level troubleshooting. The jig includes an RF interface for GSM, WCDMA and Bluetooth. In addition, it has the following features: • Provides mechanical interface with the engine module • Provides galvanic connection to all needed test pads in module • Multiplexing between USB and FBUS media, controlled by Vusb • MMC interface • Duplicated SIM connector • Connector for control unit • Access for AV- and USB connectors		
	RJ-227	Rework jig	
	RJ-227 is a rework jig used when servicing the BTHFM module (D6000). It is used together with the ST-70 rework stencil.		
	RJ-230	Soldering jig	
	RJ-230 is a soldering jig used for soldering and as a rework jig for the engine module.		

<table>
<tr><td rowspan="2">SA-140
 </td><td>SA-140</td><td>RF coupler</td><td></td></tr>
<tr><td colspan="3">SA-140 is an RF coupler for GSM and WCDMA RF testing. It is used together with the product-specific flash adapter.
The following table shows attenuations from the antenna pads of the mobile terminal to the SMA connectors of SA-140:
• TABLE TO BE UPDATED
<table>
<tr><th>Frequency</th><th>Att. (dB)</th></tr>
<tr><td>GSM850 TX</td><td></td></tr>
<tr><td>GSM850 RX</td><td></td></tr>
<tr><td>GSM900 TX</td><td></td></tr>
<tr><td>GSM900 RX</td><td></td></tr>
<tr><td>GSM1800 TX</td><td></td></tr>
<tr><td>GSM1800 RX</td><td></td></tr>
<tr><td>GSM1900 TX</td><td></td></tr>
<tr><td>GSM1900 RX</td><td></td></tr>
<tr><td>WCDMA band V TX</td><td></td></tr>
<tr><td>WCDMA band V RX</td><td></td></tr>
<tr><td>WCDMA band I TX</td><td></td></tr>
<tr><td>WCDMA band I RX</td><td></td></tr>
</table></td></tr>
<tr><td rowspan="2">SS-124
 </td><td>SS-124</td><td>Domesheet tool</td><td></td></tr>
<tr><td colspan="3">The purpose of the domesheet tool SS-124 is to support the placement of a domesheet on the PWB.</td></tr>
<tr><td rowspan="2">ST-70
</td><td>ST-70</td><td>Rework stencil</td><td></td></tr>
<tr><td colspan="3">ST-70 rework stencil is used with RJ-227 rework jig to service the BTHFM module (D6000).</td></tr>
</table>

General devices

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-414. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

CU-4

CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

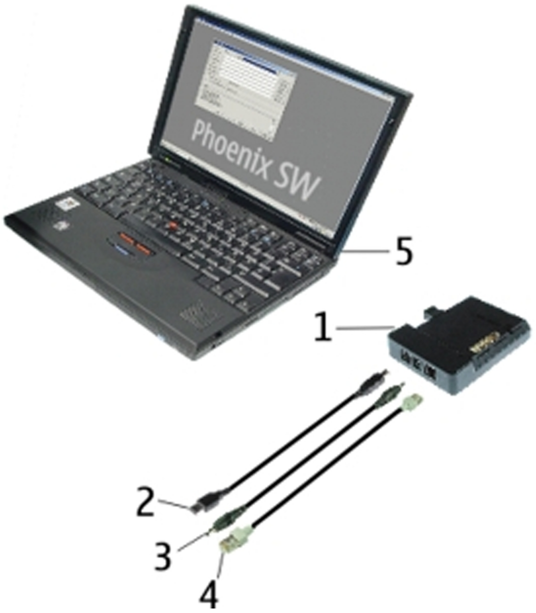
The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

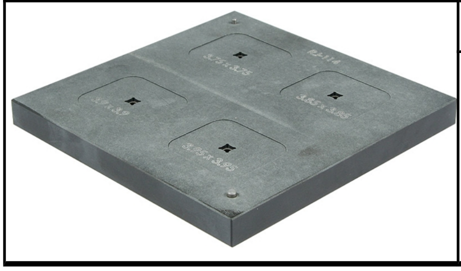
1. Connect a service tool (jig, flash adapter) to CU-4.
2. Connect CU-4 to your PC with a USB cable.
3. Connect supply voltage (12 V)
4. Connect an FBUS cable (if necessary).
5. Start Phoenix service software.

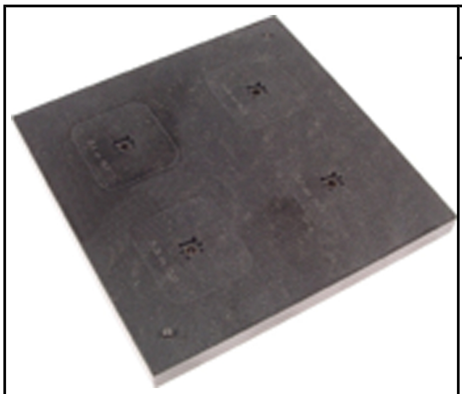


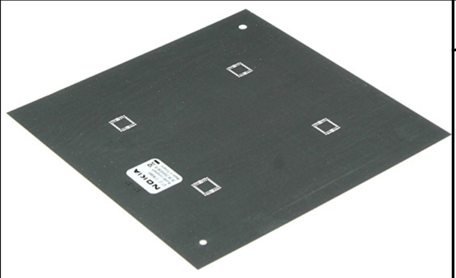
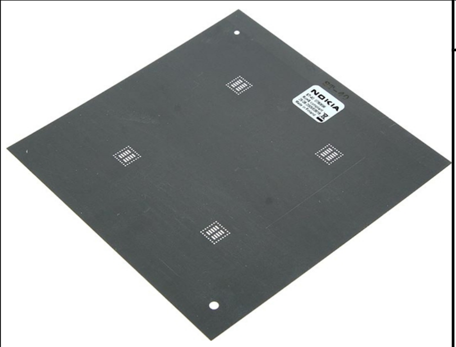
Note: Phoenix enables CU-4 regulators via USB when it is started.

Reconnecting the power supply requires a Phoenix restart.

<table>
<tr><td rowspan="2"> </td><td>FLS-5</td><td>Flash device</td><td></td></tr>
<tr><td colspan="3">FLS-5 is a dongle and flash device incorporated into one package, developed specifically for POS use.
Note: FLS-5 can be used as an alternative to PKD-1.</td></tr>
<tr><td rowspan="2"> </td><td>FPS-10</td><td>Flash prommer</td><td></td></tr>
<tr><td colspan="3">FPS-10 interfaces with:
• PC
• Control unit
• Flash adapter
• Smart card
FPS-10 flash prommer features:
• Flash functionality for BB5 and DCT-4 terminals
• Smart Card reader for SX-2 or SX-4
• USB traffic forwarding
• USB to FBUS/Flashbus conversion
• LAN to FBUS/Flashbus and USB conversion
• Vusb output switchable by PC command
FPS-10 sales package includes:
• FPS-10 prommer
• Power Supply with 5 country specific cords
• USB cable
Note: FPS-21 is substitute FPS-10 if FPS-10 has not been set up.</td></tr>
<tr><td rowspan="2"> </td><td>JBT-9</td><td>Bluetooth test and interface box (sales package)</td><td></td></tr>
<tr><td colspan="3">The JBT-9 test box is a generic service device used to perform Bluetooth bit error rate (BER) testing, and establishing cordless FBUS connection via Bluetooth. An ACP-8x charger is needed for BER testing and an AXS-4 cable in case of cordless interface usage testing .
Sales package includes:
• JBT-9 test box
• Installation and warranty information</td></tr>
</table>

	JXS-1	RF shield box	
	Because the WCDMA network disturbs the RX side testing of the WCDMA phone and the Tx signal of the WCDMA phone can severely disturb the WCDMA network, a shield box is needed in all testing, tuning and fault finding which requires WCDMA RF signal. The shield box is not an active device, it contains only passive filtering components for RF attenuation.		
	PK-1	Software protection key	
	PK-1 is a hardware protection key with a USB interface. It has the same functionality as the PKD-1 series dongle. PK-1 is meant for use with a PC that does not have a series interface. To use this USB dongle for security service functions please register the dongle in the same way as the PKD-1 series dongle.		
	PKD-1	SW security device	
	SW security device is a piece of hardware enabling the use of the service software when connected to the parallel (LPT) port of the PC. Without the device, it is not possible to use the service software. Printer or any such device can be connected to the PC through the device if needed.		
	RJ-104	Rework jig	
	RJ-104 is a rework jig used when servicing the BTHFM module. It is used together with rework stencil ST-37.		
	RJ-114	Rework jig	
	RJ-114 is a rework jig used with ST-41.		

	RJ-57	Rework jig	
	RJ-57 is a rework jig used with ST-22.		
	RJ-93	Rework jig	
	RJ-93 is used as a rework jig for the engine module. This stencil takes the front end module (FEM) or power amplifier (PA) module for spreading the soldering paste to the component. Must be used together with the ST-40 stencil.		
	SPS-1	Soldering Paste Spreader	
	The SPS-1 allows spreading of solder to the LGA components pads over the rework stencils.		
	SRT-6	Opening tool	
	SRT-6 is used to open phone covers.		

<table>
<tr><td rowspan="2"> </td><td>SS-46</td><td>Interface adapter</td><td></td></tr>
<tr><td colspan="3">SS-46 acts as an interface adapter between the flash adapter and FPS-10.</td></tr>
<tr><td rowspan="2"> </td><td>SS-62</td><td>Generic flash adapter base for BB5</td><td></td></tr>
<tr><td colspan="3">• generic base for flash adapters and couplers
• SS-62 equipped with a clip interlock system
• provides standardised interface towards Control Unit
• provides RF connection using galvanic connector or coupler
• multiplexing between USB and FBUS media, controlled by VUSB</td></tr>
<tr><td rowspan="2"></td><td>ST-37</td><td>BTHFM rework stencil</td><td></td></tr>
<tr><td colspan="3">ST-37 stencil is used with RJ-104 BTHFM rework jig.</td></tr>
<tr><td rowspan="2"></td><td>ST-40</td><td>Rework stencil</td><td></td></tr>
<tr><td colspan="3">ST-40 is a rework stencil and used with RJ-93.</td></tr>
<tr><td rowspan="2"> </td><td>ST-41</td><td>Rework stencil</td><td></td></tr>
<tr><td colspan="3">ST-41 is a rework stencil used with rework jig RJ-114.</td></tr>
<tr><td rowspan="2"> </td><td>ST-44</td><td>Rework stencil</td><td></td></tr>
<tr><td colspan="3">ST-44 is a rework stencil used with rework jig RJ-57.</td></tr>
</table>

	SX-4	Smart card	
	SX-4 is a BB5 security device used to protect critical features in tuning and testing. SX-4 is also needed together with FPS-10 when DCT-4 phones are flashed.		

Cables

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-414. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

CA-101 100cm	CA-101	Micro USB cable	
	The CA-101 is a USB-to-microUSB data cable that allows connections between the PC and the phone.		
	CA-31D	USB cable	
	The CA-31D USB cable is used to connect FPS-10 or FPS-11 to a PC. It is included in the FPS-10 and FPS-11 sales packages.		

	CA-35S	Power cable	
	CA-35S is a power cable for connecting, for example, the FPS-10 flash prommer to the Point-Of-Sales (POS) flash adapter.		
	PCS-1	Power cable	
	The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled voltage.		
	XCS-4	Modular cable	
	XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.		

	XRS-6	RF cable	
	The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment. SMA to N-Connector approximately 610 mm. Attenuation for: • GSM850/900: 0.3+-0.1 dB • GSM1800/1900: 0.5+-0.1 dB • WCDMA/WLAN: 0.6+-0.1dB		

Service concepts

POS (Point of Sale) flash concept

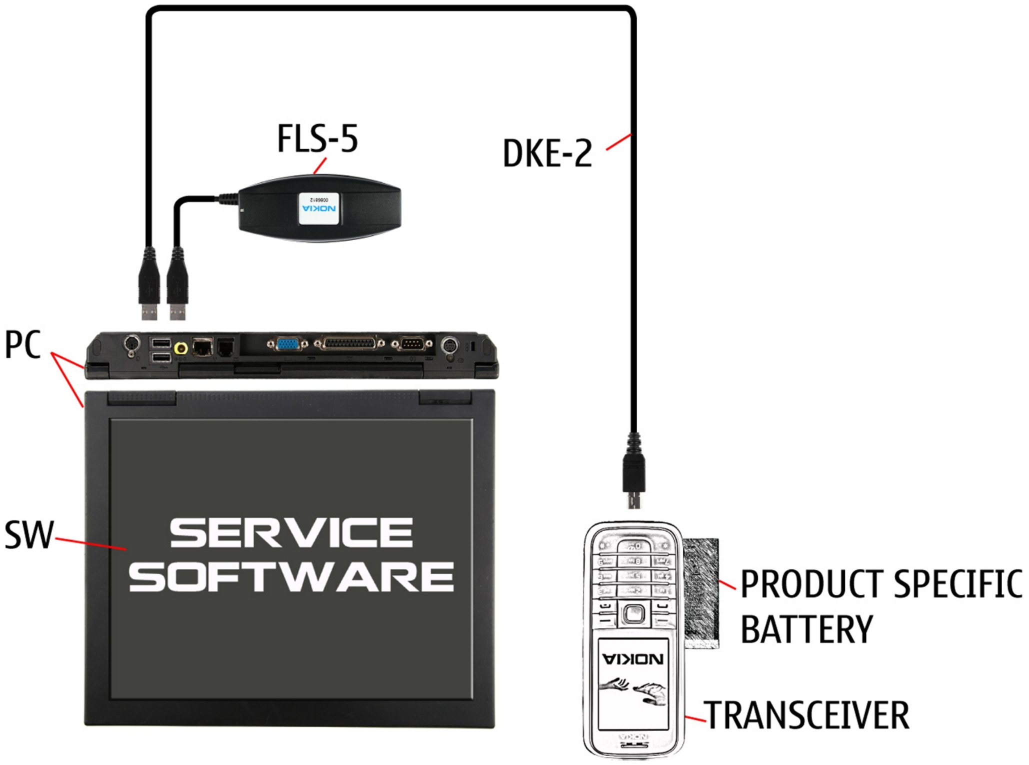

FLS-5
DKE-2
PC
SW
SERVICE SOFTWARE
PRODUCT SPECIFIC BATTERY
TRANSCEIVER

Figure 2 POS flash concept

Type	Description
Product specific tools	
BL-4U	Battery
Other tools	
FLS-5	POS flash dongle
	PC with Phoenix service software
Cables	

Type	Description
DKE-2	USB connectivity cable

Flash concept with FPS-10

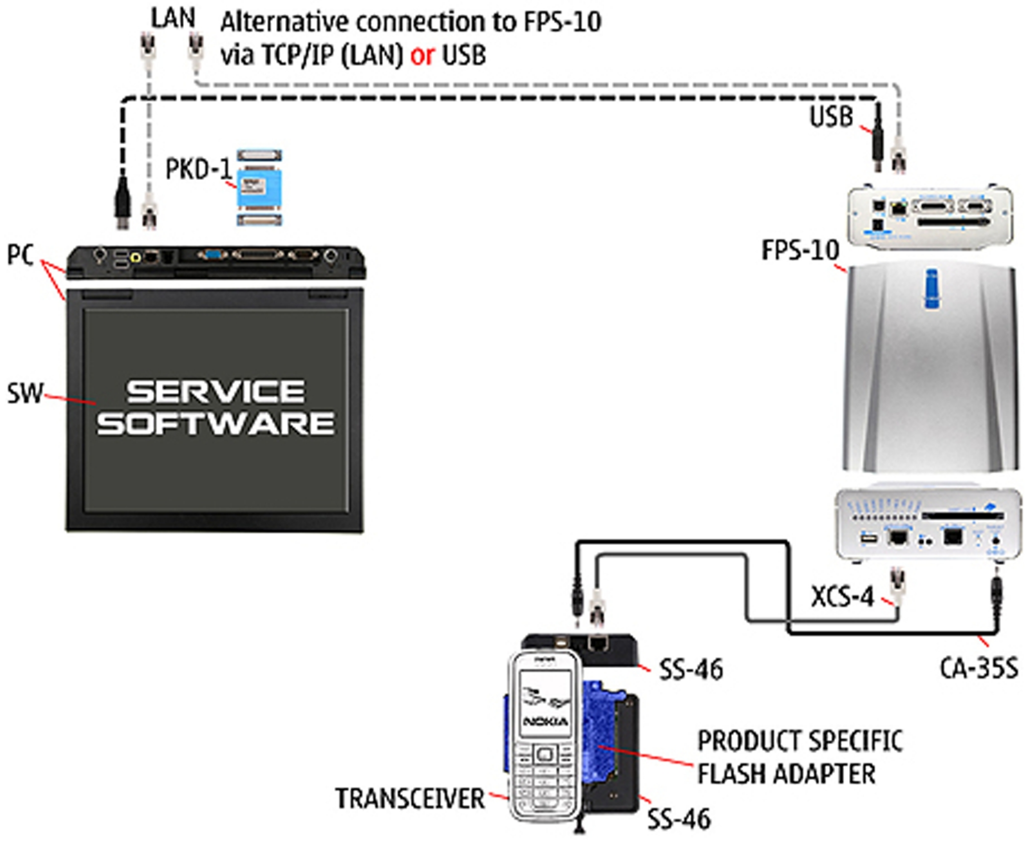

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
USB
PKD-1
PC
SW
SERVICE
SOFTWARE
FPS-10
XCS-4
SS-46
CA-35S
PRODUCT SPECIFIC
FLASH ADAPTER
TRANSCEIVER
SS-46

Figure 3 Basic flash concept with FPS-10

Type	Description
Product specific devices	
FS-87	Flash adapter
Other devices	
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-46	Interface adapter
	PC with Phoenix service software
Cables	
XCS-4	Modular cable
CA-35S	Power cable
	USB cable

CU-4 flash concept with FPS-10

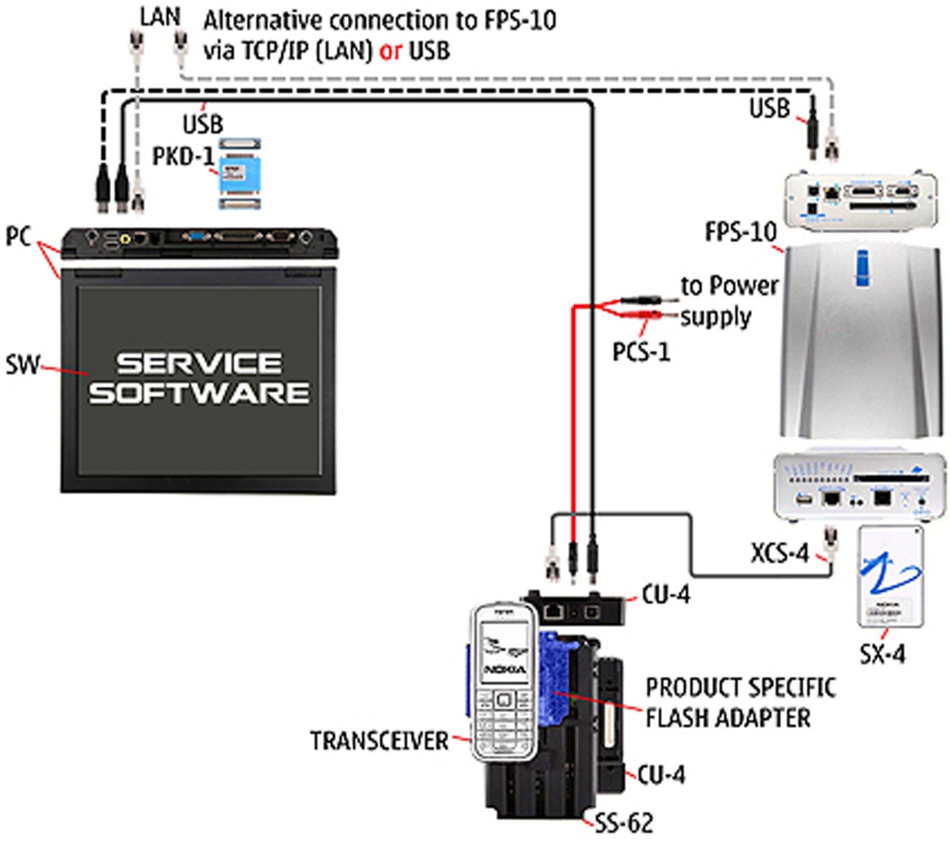

LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
USB
PKD-1
USB
PC
SW
SERVICE
SOFTWARE
FPS-10
to Power
supply
PCS-1
XCS-4
CU-4
SX-4
PRODUCT SPECIFIC
FLASH ADAPTER
TRANSCEIVER
CU-4
SS-62

Figure 4 CU-4 flash concept with FPS-10

Type	Description
Product specific devices	
FS-87	Flash adapter
Other devices	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
SX-4	Smart card
	PC with Phoenix service software
Cables	
PCS-1	Power cable
XCS-4	Modular cable
	Standard USB cable
	USB cable

Module jig service concept

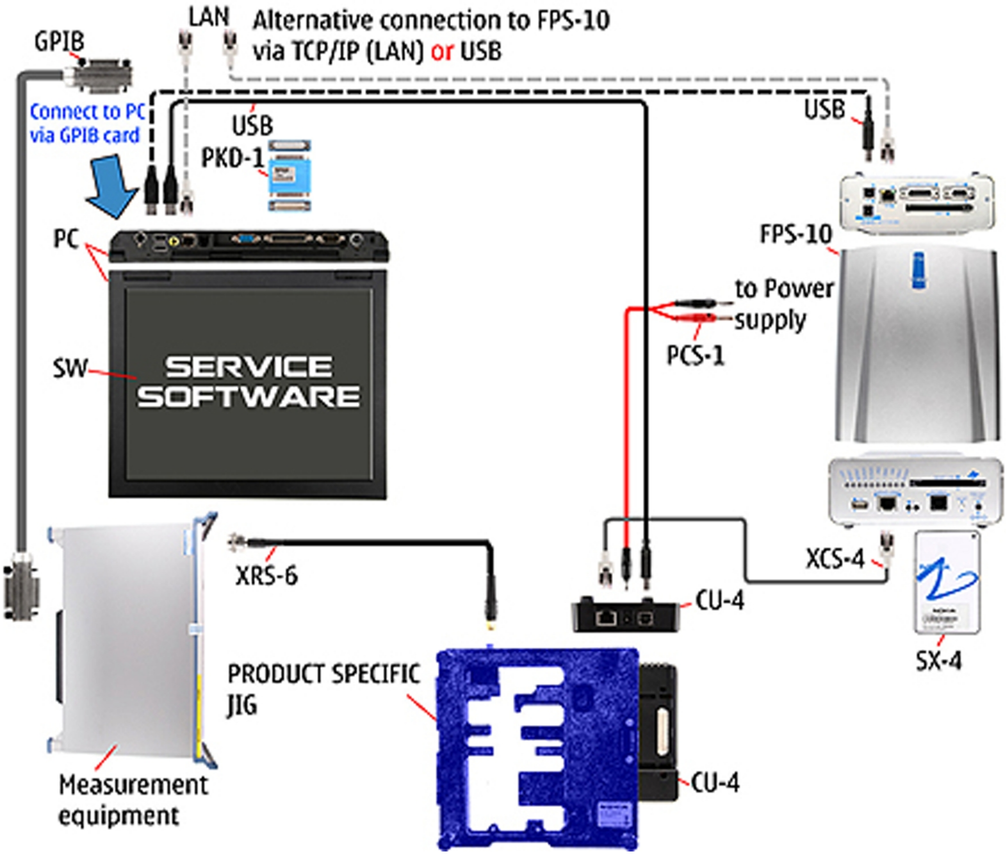

LAN
Alternative connection to FPS-10 via TCP/IP (LAN) or USB
GPIB
Connect to PC via GPIB card
USB
PKD-1
USB
FPS-10
PC
to Power supply
PCS-1
SW
SERVICE SOFTWARE
XRS-6
XCS-4
CU-4
SX-4
PRODUCT SPECIFIC JIG
CU-4
Measurement equipment

Figure 5 Module jig service concept

Type	Description
Phone specific devices	
MJ-183	Module jig
Other devices	
CU-4	Control unit
FPS-10	Flash prommer box
PK-1	SW security device
SX-4	Smart card
	PC with VPOS and Phoenix service software
	Measurement equipment
Cables	
PCS-1	DC power cable
XCS-4	Modular cable
XRF-1	RF cable
	USB cable

Type	Description
	GPIB control cable

RF testing concept with RF coupler

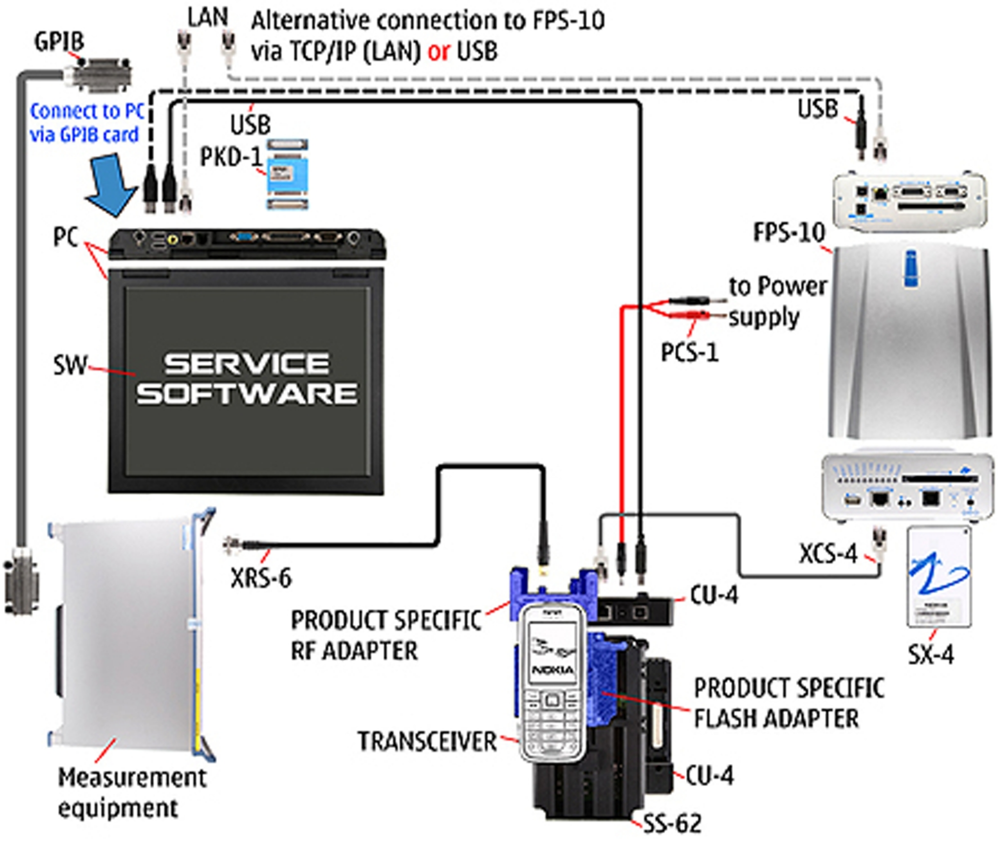

GPIB
LAN
Alternative connection to FPS-10
via TCP/IP (LAN) or USB
Connect to PC
via GPIB card
USB
PKD-1
USB
PC
FPS-10
to Power
supply
PCS-1
SW
SERVICE
SOFTWARE
XCS-4
XRS-6
CU-4
PRODUCT SPECIFIC
RF ADAPTER
SX-4
PRODUCT SPECIFIC
FLASH ADAPTER
TRANSCEIVER
CU-4
Measurement
equipment
SS-62

Figure 6 RF testing concept with RF coupler

Type	Description
Product specific devices	
FS-87	Flash adapter
SA-140	RF coupler
Other devices	
CU-4	Control unit
SX-4	Smart card
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
	Measurement equipment
	PC with Phoenix service software
Cables	
PCS-1	Power cable

Type	Description
XCS-4	Modular cable
XRS-6	RF cable
	GPIB control cable
	USB cable

Service concept for RF testing and RF/BB tuning

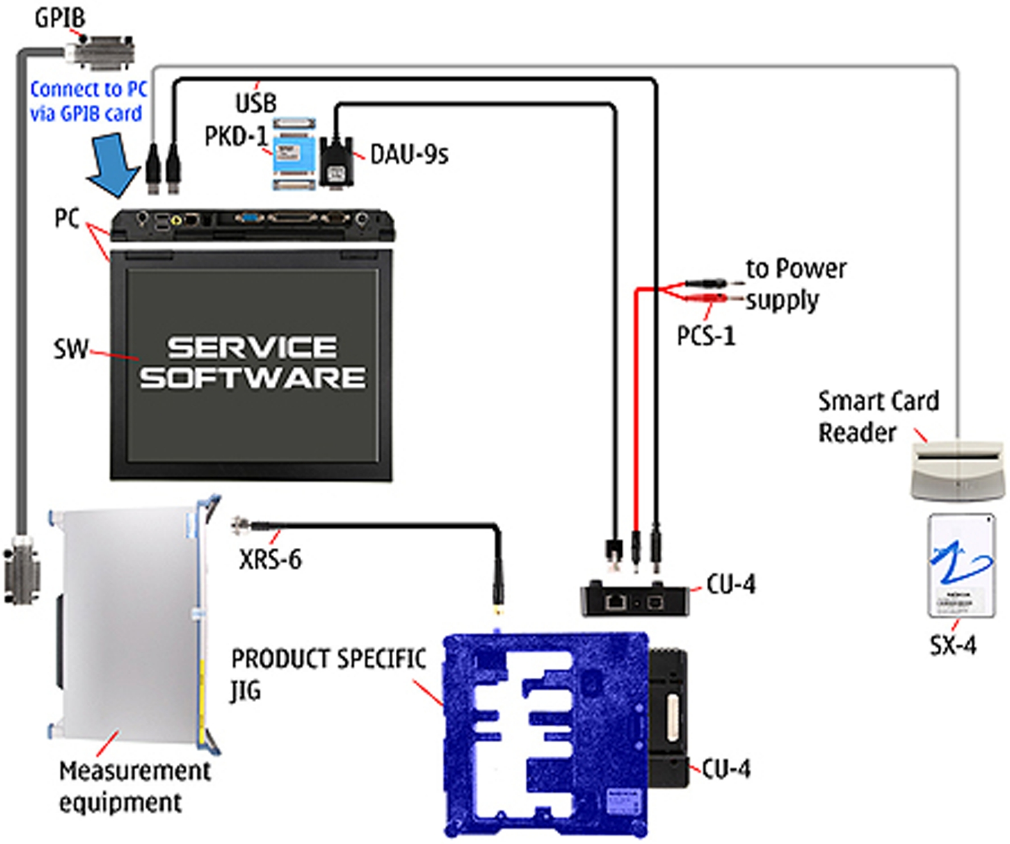

GPIB
Connect to PC via GPIB card
USB
PKD-1
DAU-9s
PC
SW
SERVICE SOFTWARE
to Power supply
PCS-1
Smart Card Reader
XRS-6
CU-4
SX-4
PRODUCT SPECIFIC JIG
CU-4
Measurement equipment

Figure 7 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific devices	
MJ-183	Module jig
Other devices	
CU-4	Control unit
PK-1	SW security device
SX-4	Smart card
	Measurement equipment
	Smart card reader
	PC with Phoenix service software

Type	Description
Cables	
DAU-9S	MBUS cable
PCS-1	DC power cable
XRS-6	RF cable
	GPIB control cable
	USB cable

3 — BB Troubleshooting and Manual Tuning Guide

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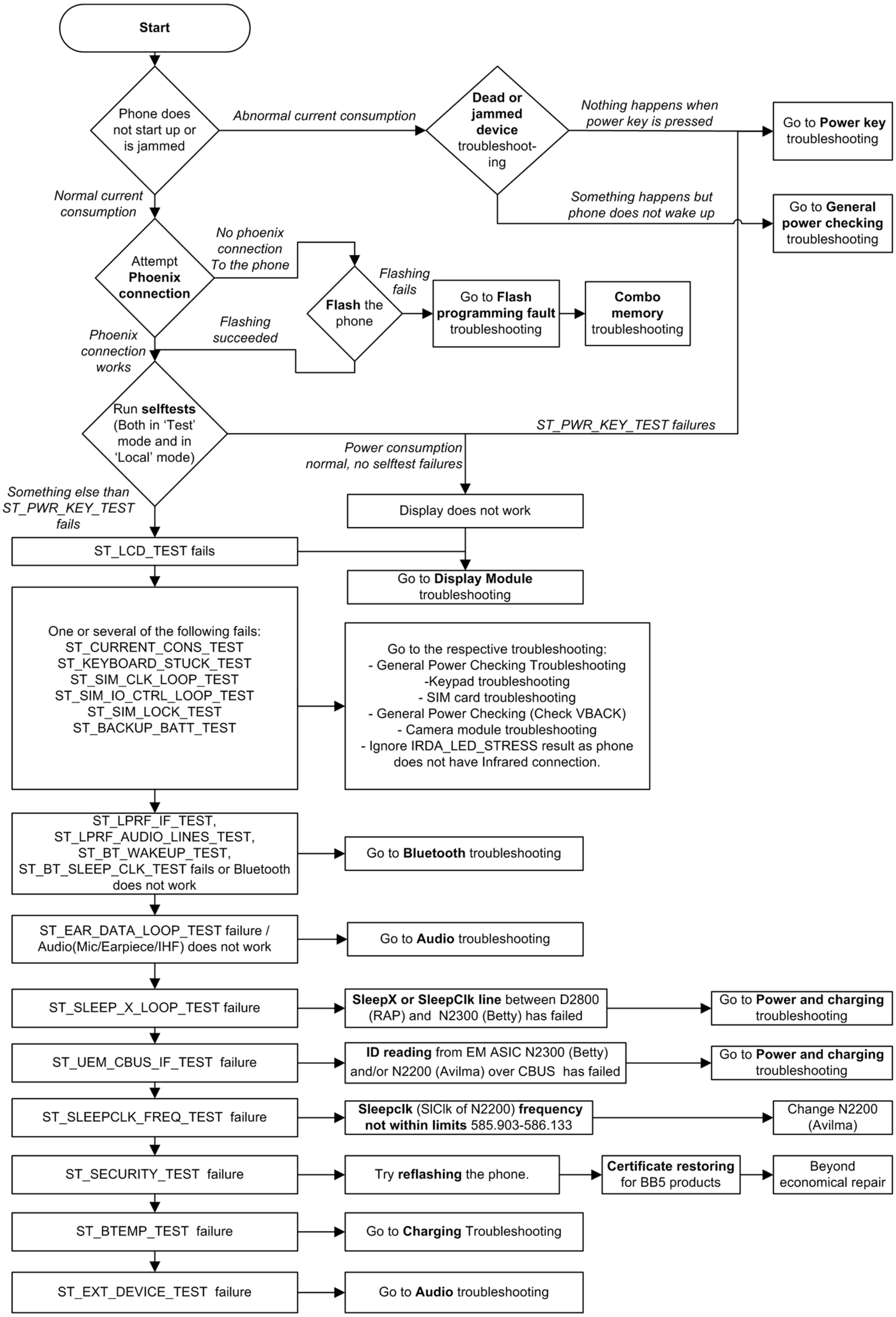
Baseband self tests in Phoenix

Context

Always start the troubleshooting procedure by running the Phoenix self tests. If a test fails, please follow the diagram below.

If the phone is dead and you cannot perform the self tests, go to *Dead or jammed device troubleshooting.*

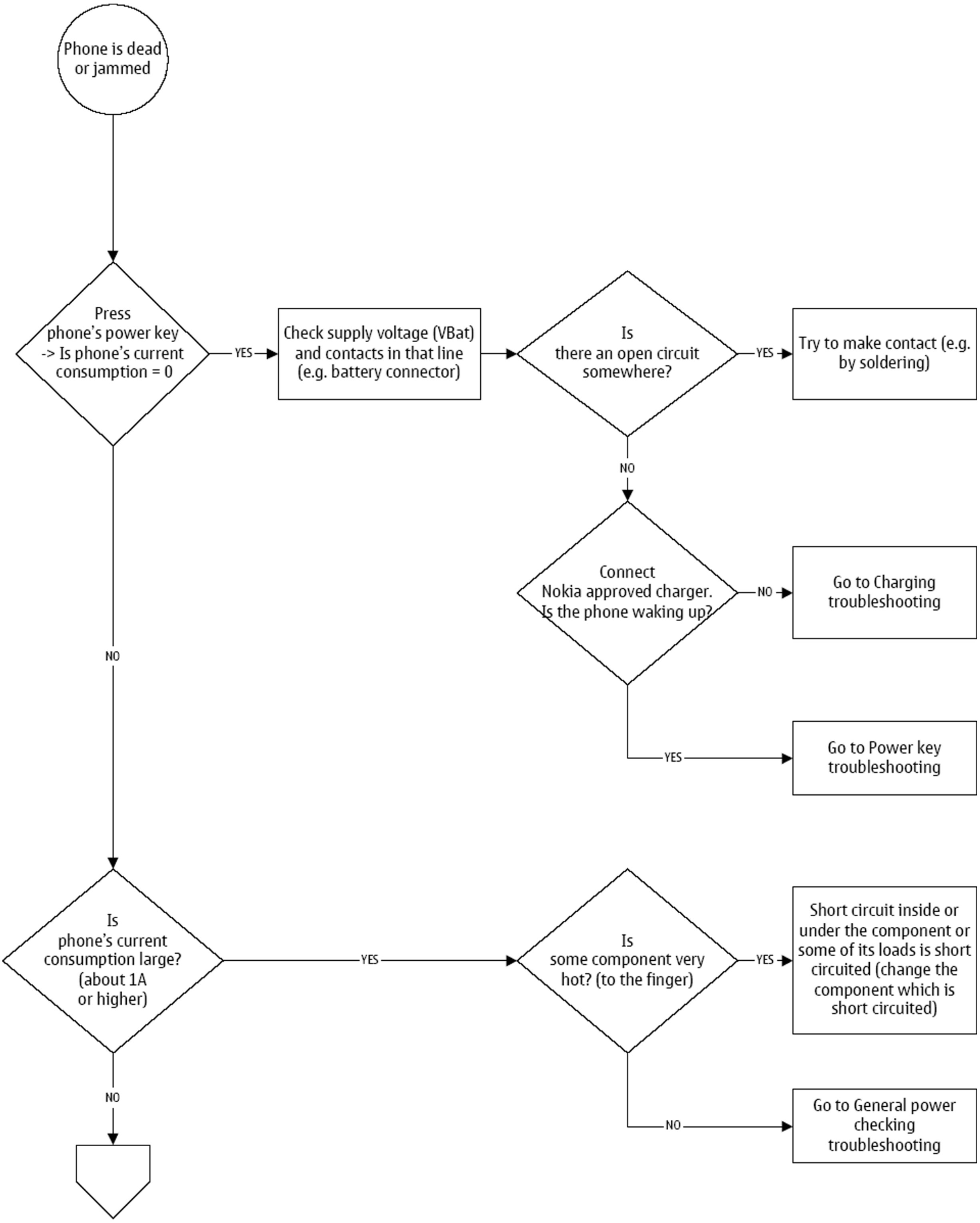
Troubleshooting flow


Start
Phone does not start up or is jammed
Abnormal current consumption
Dead or jammed device troubleshooting
Nothing happens when power key is pressed
Go to Power key troubleshooting
Something happens but phone does not wake up
Go to General power checking troubleshooting
Normal current consumption
Attempt Phoenix connection
No phoenix connection To the phone
Flash the phone
Flashing fails
Go to Flash programming fault troubleshooting
Combo memory troubleshooting
Flashing succeeded
Phoenix connection works
Run selftests (Both in 'Test' mode and in 'Local' mode)
ST_PWR_KEY_TEST failures
Power consumption normal, no selftest failures
Display does not work
Something else than ST_PWR_KEY_TEST fails
ST_LCD_TEST fails
Go to Display Module troubleshooting
One or several of the following fails: ST_CURRENT_CONS_TEST ST_KEYBOARD_STUCK_TEST ST_SIM_CLK_LOOP_TEST ST_SIM_IO_CTRL_LOOP_TEST ST_SIM_LOCK_TEST ST_BACKUP_BATT_TEST
Go to the respective troubleshooting: - General Power Checking Troubleshooting -Keypad troubleshooting - SIM card troubleshooting - General Power Checking (Check VBACK) - Camera module troubleshooting - Ignore IRDA_LED_STRESS result as phone does not have Infrared connection.
ST_LPRF_IF_TEST, ST_LPRF_AUDIO_LINES_TEST, ST_BT_WAKEUP_TEST, ST_BT_SLEEP_CLK_TEST fails or Bluetooth does not work
Go to Bluetooth troubleshooting
ST_EAR_DATA_LOOP_TEST failure / Audio(Mic/Earpiece/IHF) does not work
Go to Audio troubleshooting
ST_SLEEP_X_LOOP_TEST failure
SleepX or SleepClk line between D2800 (RAP) and N2300 (Betty) has failed
Go to Power and charging troubleshooting
ST_UEM_CBUS_IF_TEST failure
ID reading from EM ASIC N2300 (Betty) and/or N2200 (Avilma) over CBUS has failed
Go to Power and charging troubleshooting
ST_SLEEPCLK_FREQ_TEST failure
Sleepclk (SlClk of N2200) frequency not within limits 585.903-586.133
Change N2200 (Avilma)
ST_SECURITY_TEST failure
Try reflashing the phone.
Certificate restoring for BB5 products
Beyond economical repair
ST_BTEMP_TEST failure
Go to Charging Troubleshooting
ST_EXT_DEVICE_TEST failure
Go to Audio troubleshooting

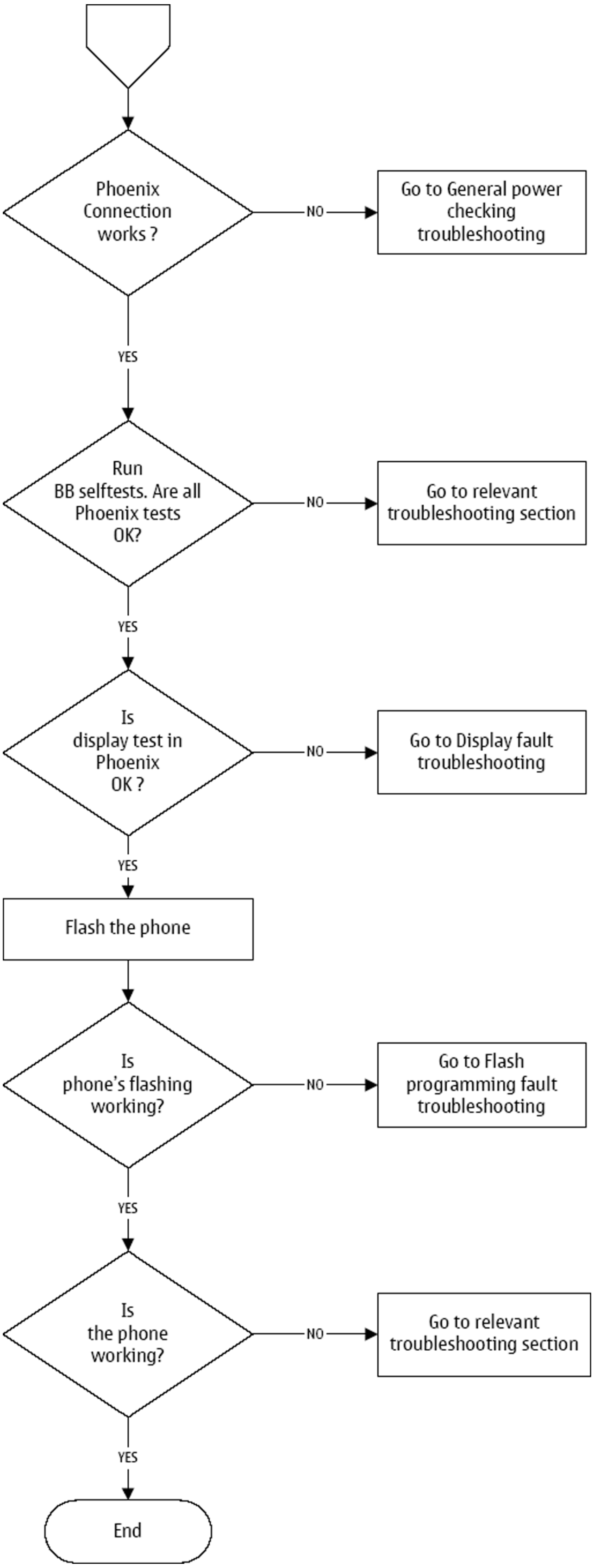
Power and charging troubleshooting

Dead or jammed device troubleshooting

Troubleshooting flow


Phone is dead or jammed
Press phone's power key -> Is phone's current consumption = 0
YES
Check supply voltage (VBat) and contacts in that line (e.g. battery connector)
Is there an open circuit somewhere?
YES
Try to make contact (e.g. by soldering)
NO
Connect Nokia approved charger. Is the phone waking up?
NO
Go to Charging troubleshooting
YES
Go to Power key troubleshooting
NO
Is phone's current consumption large? (about 1A or higher)
YES
Is some component very hot? (to the finger)
YES
Short circuit inside or under the component or some of its loads is short circuited (change the component which is short circuited)
NO
Go to General power checking troubleshooting
NO

Troubleshooting flow


Phoenix Connection works ?
NO
Go to General power checking troubleshooting
YES
Run BB selftests. Are all Phoenix tests OK?
NO
Go to relevant troubleshooting section
YES
Is display test in Phoenix OK ?
NO
Go to Display fault troubleshooting
YES
Flash the phone
Is phone's flashing working?
NO
Go to Flash programming fault troubleshooting
YES
Is the phone working?
NO
Go to relevant troubleshooting section
YES
End

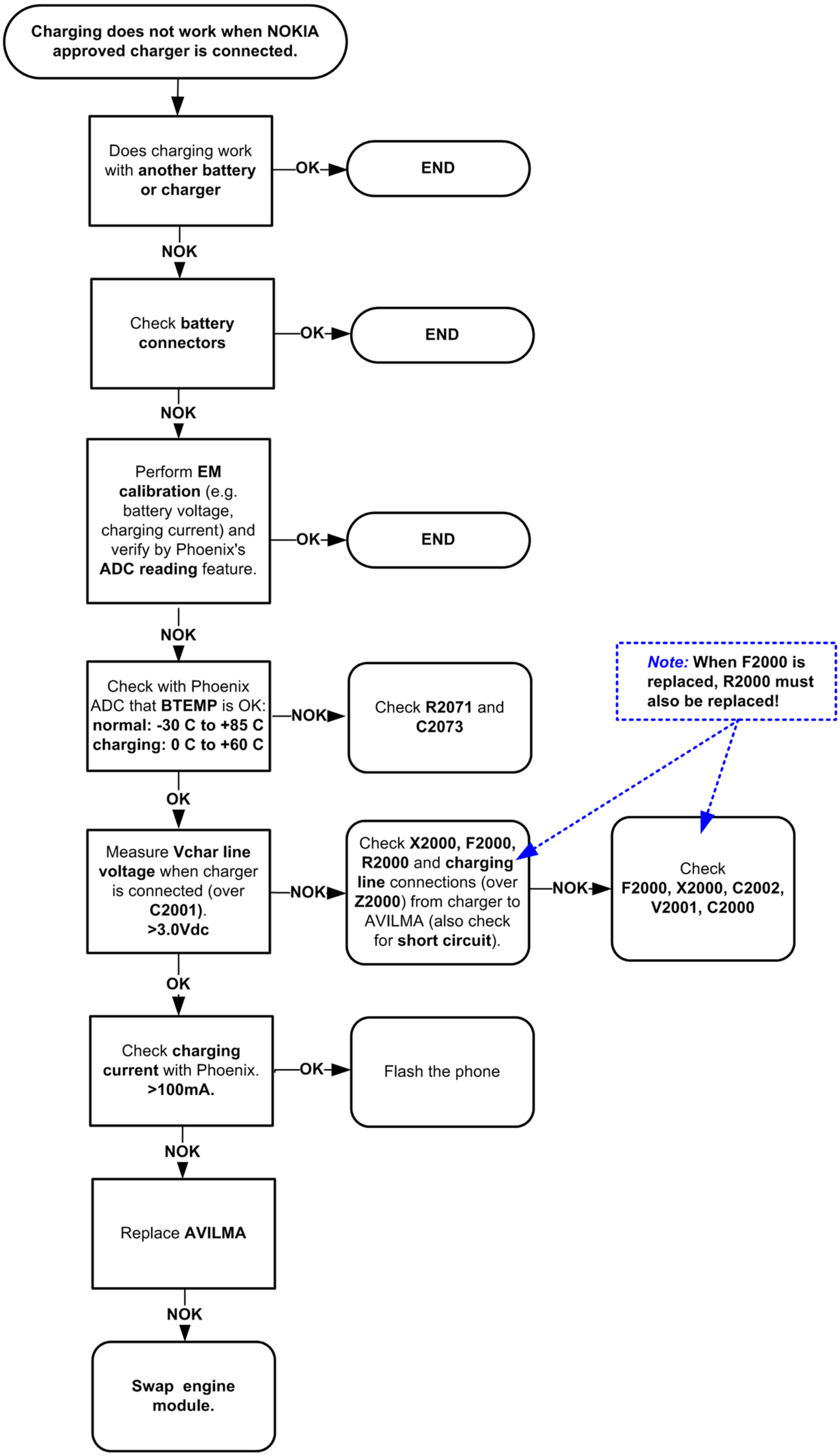
General power checking

Check the following voltages:

Signal Rename	Regulator	Sleep	Idle	Nominal voltage	Main user	Notes
VIO	AVILMA	ON	ON	1.82	Memory, I/Os, Display, USB	
VBACK	AVILMA	ON	ON	2.50	Back-up battery	
VSIM1	AVILMA	ON	ON	1.8/3.0	SIM card	
VSIM2	AVILMA	OFF	OFF	1.8/3.0		
VDRAM	AVILMA	ON	ON	1.82	SDRAM	
VAUX	AVILMA	OFF	OFF	2.78	Accelerometer, hall sensor, ALS	
VANA	AVILMA	OFF	OFF	2.50		
VR1	AVILMA	OFF	ON	2.50	Crystal oscillators	RF section
VRFC	AVILMA	OFF	ON	1.80	RAP3G converters	
VRCP1	AVILMA			4.75	To RF parts	RF active
VREF	AVILMA	ON	ON	1.35	RF reference	
VCORE	BETTY	ON	ON	1.05 (sleep) 1.35	RAP3G digital	
VOUT	BETTY	OFF	OFF	2.50		Accessory connected
VCAM_2V8	LP3987ITLX-2.85/N3303	OFF	OFF	2.85	Camera	Disabled in sleep
VCAM_1V8	LM3677TLX-1.82/N3301	OFF	OFF	1.80	Camera	Disabled in sleep
VCAM_1V3	LP5952TLX-1.3/N3302	OFF	OFF	1.30	Camera	Disabled in sleep
VIBRA+	LP3985ITLX-3.0/N2100	ON	ON	3.00	Vibra	Only turned off in "Power off" mode
VSD	LP3929TMEX-AACQ/N4802	OFF	OFF	2.85	SD card	Disabled in sleep
LIGHT	LP5521TMX/N2401	OFF	OFF	3.6 2.1	Key light, top light alive light	

DC charging troubleshooting

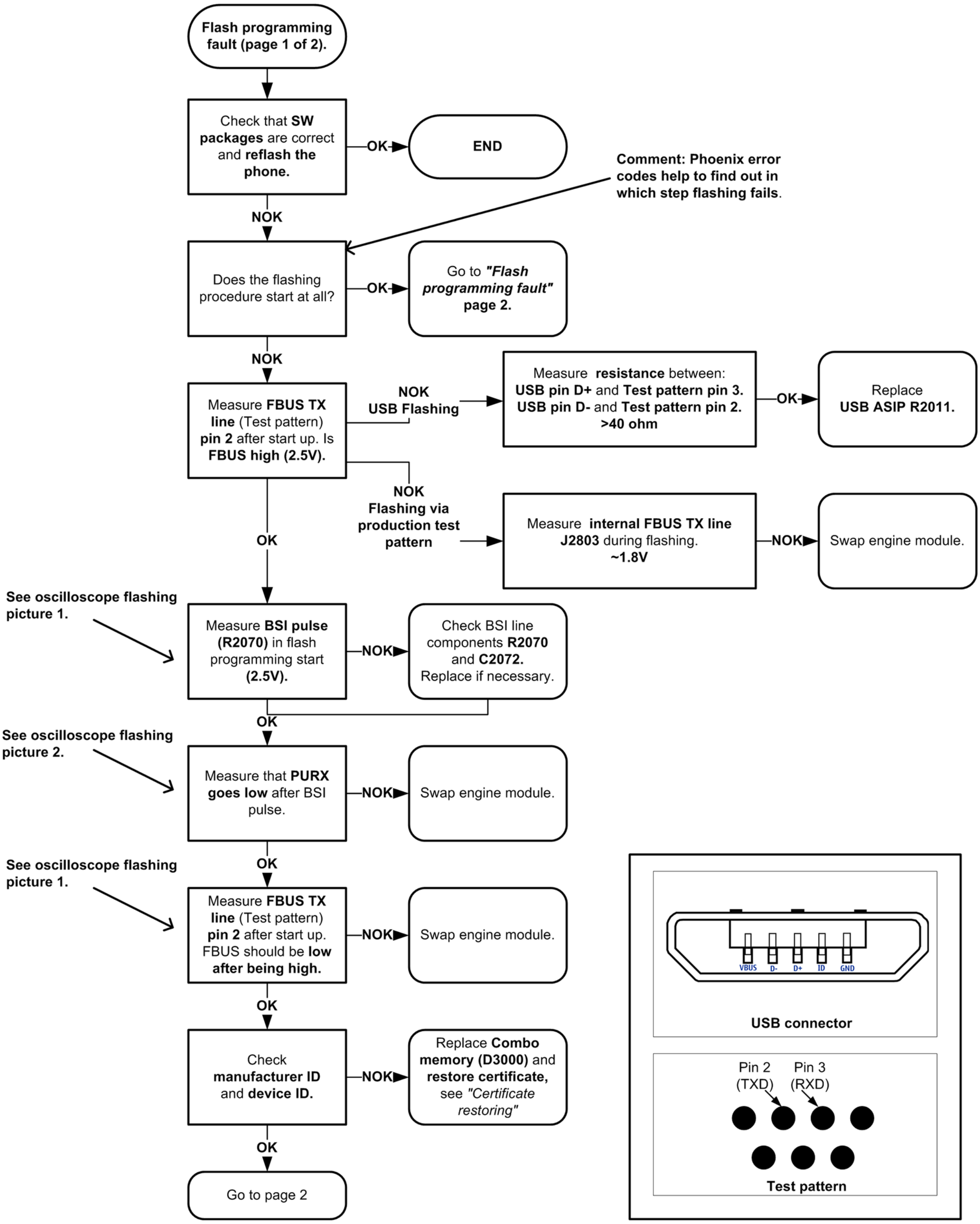
Troubleshooting flow


Charging does not work when NOKIA approved charger is connected.
Does charging work with another battery or charger
OK
END
NOK
Check battery connectors
OK
END
NOK
Perform EM calibration (e.g. battery voltage, charging current) and verify by Phoenix's ADC reading feature.
OK
END
NOK
Check with Phoenix ADC that BTEMP is OK: normal: -30 C to +85 C charging: 0 C to +60 C
NOK
Check R2071 and C2073
Note: When F2000 is replaced, R2000 must also be replaced!
OK
Measure Vchar line voltage when charger is connected (over C2001). >3.0Vdc
NOK
Check X2000, F2000, R2000 and charging line connections (over Z2000) from charger to AVILMA (also check for short circuit).
NOK
Check F2000, X2000, C2002, V2001, C2000
OK
Check charging current with Phoenix. >100mA.
OK
Flash the phone
NOK
Replace AVILMA
NOK
Swap engine module.

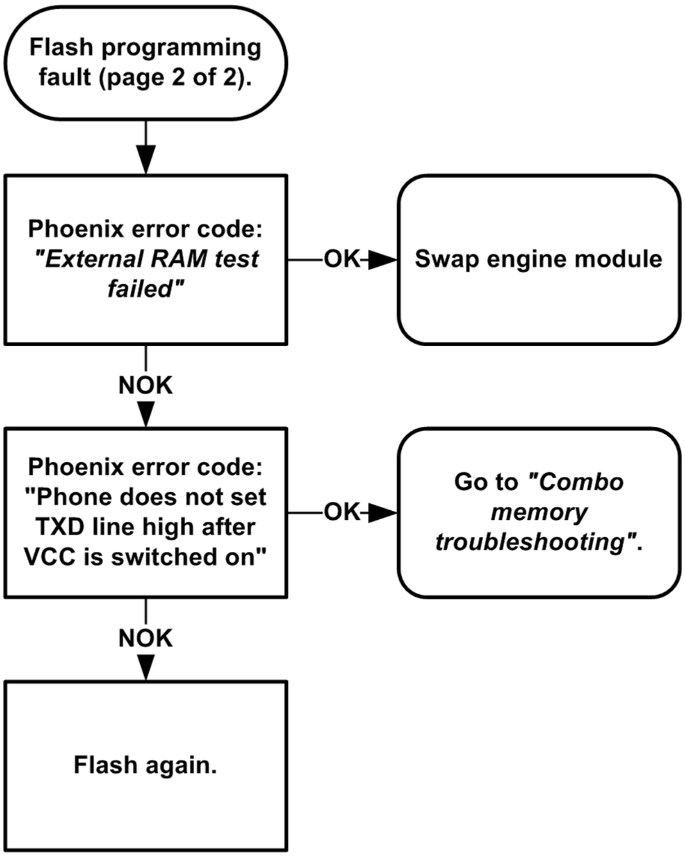
Interface troubleshooting

Flash programming fault troubleshooting

Part 1


Flash programming fault (page 1 of 2).
Check that SW packages are correct and reflash the phone.
OK
END
NOK
Comment: Phoenix error codes help to find out in which step flashing fails.
Does the flashing procedure start at all?
OK
Go to "Flash programming fault" page 2.
NOK
Measure FBUS TX line (Test pattern) pin 2 after start up. Is FBUS high (2.5V).
NOK
USB Flashing
Measure resistance between: USB pin D+ and Test pattern pin 3. USB pin D- and Test pattern pin 2. >40 ohm
OK
Replace USB ASIP R2011.
NOK
Flashing via production test pattern
Measure internal FBUS TX line J2803 during flashing. ~1.8V
NOK
Swap engine module.
OK
See oscilloscope flashing picture 1.
Measure BSI pulse (R2070) in flash programming start (2.5V).
NOK
Check BSI line components R2070 and C2072. Replace if necessary.
OK
See oscilloscope flashing picture 2.
Measure that PURX goes low after BSI pulse.
NOK
Swap engine module.
OK
See oscilloscope flashing picture 1.
Measure FBUS TX line (Test pattern) pin 2 after start up. FBUS should be low after being high.
NOK
Swap engine module.
OK
Check manufacturer ID and device ID.
NOK
Replace Combo memory (D3000) and restore certificate, see "Certificate restoring"
OK
Go to page 2
VBUS
D-
D+
ID
GND
USB connector
Pin 2 (TXD)
Pin 3 (RXD)
Test pattern

Part 2


Flash programming fault (page 2 of 2).
Phoenix error code: *"External RAM test failed"*
OK
Swap engine module
NOK
Phoenix error code: "Phone does not set TXD line high after VCC is switched on"
OK
Go to *"Combo memory troubleshooting"*.
NOK
Flash again.

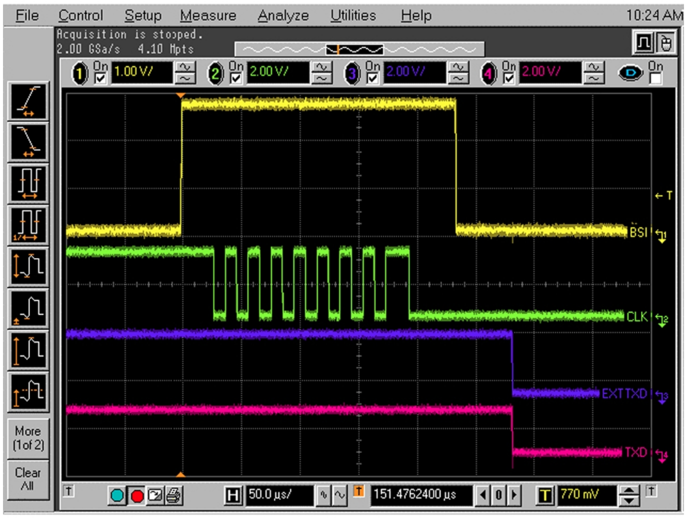
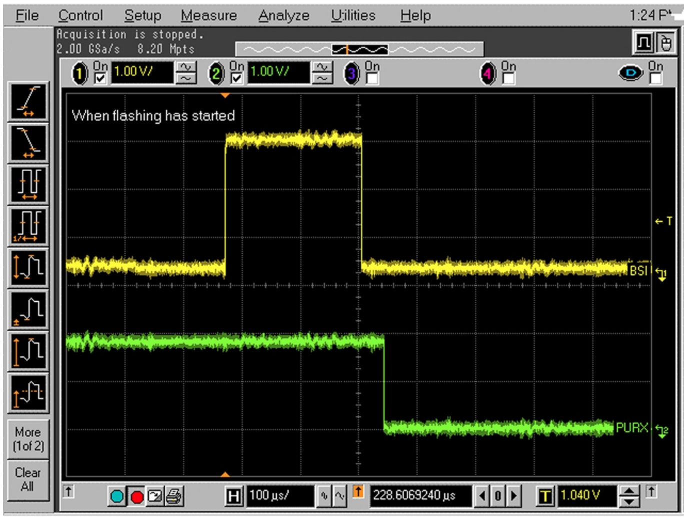

File
Control
Setup
Measure
Analyze
Utilities
Help
10:24 AM
Acquisition is stopped.
2.00 GSa/s 4.10 Mpts
1.00 V/
2.00 V/
2.00 V/
2.00 V/
BSI
CLK
EXTTXD
TXD
More (1of 2)
Clear All
50.0 µs/
151.4762400 µs
770 mV

Figure 8 Flashing pic 1. Take single trig measurement for the rise of the BSI signal.



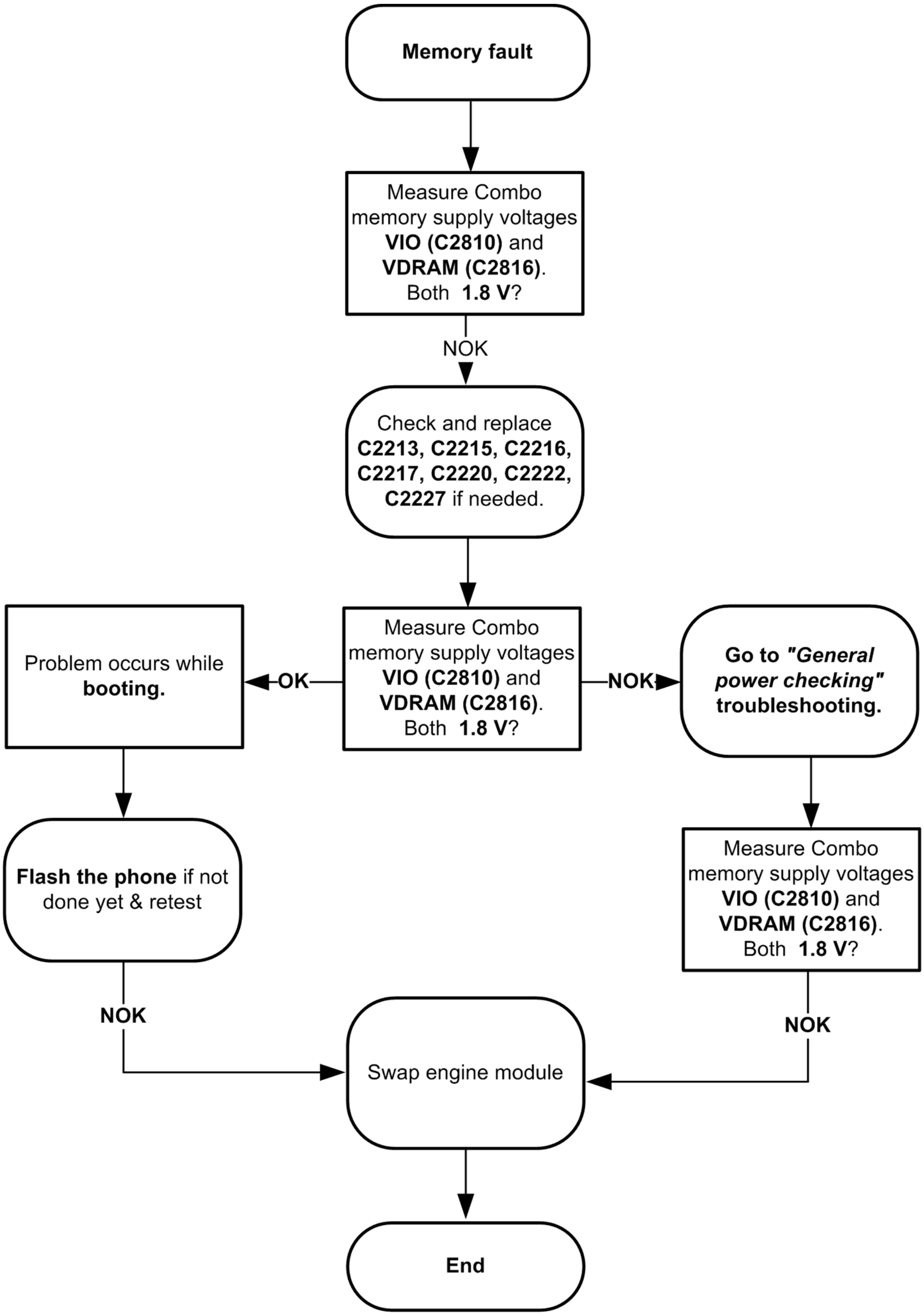
Acquisition is stopped.
2.00 GSa/s 8.20 Mpts

File
Control
Setup
Measure
Analyze
Utilities
Help
1:24 P
On
1.00 V/
On
1.00 V/
On
On
On
When flashing has started
T
BSI
PURX
More (1 of 2)
Clear All
H
100 µs/
228.6069240 µs
T
1.040 V

Figure 9 Flashing pic 2. Take single trig measurement for the rise of the BSI signal.

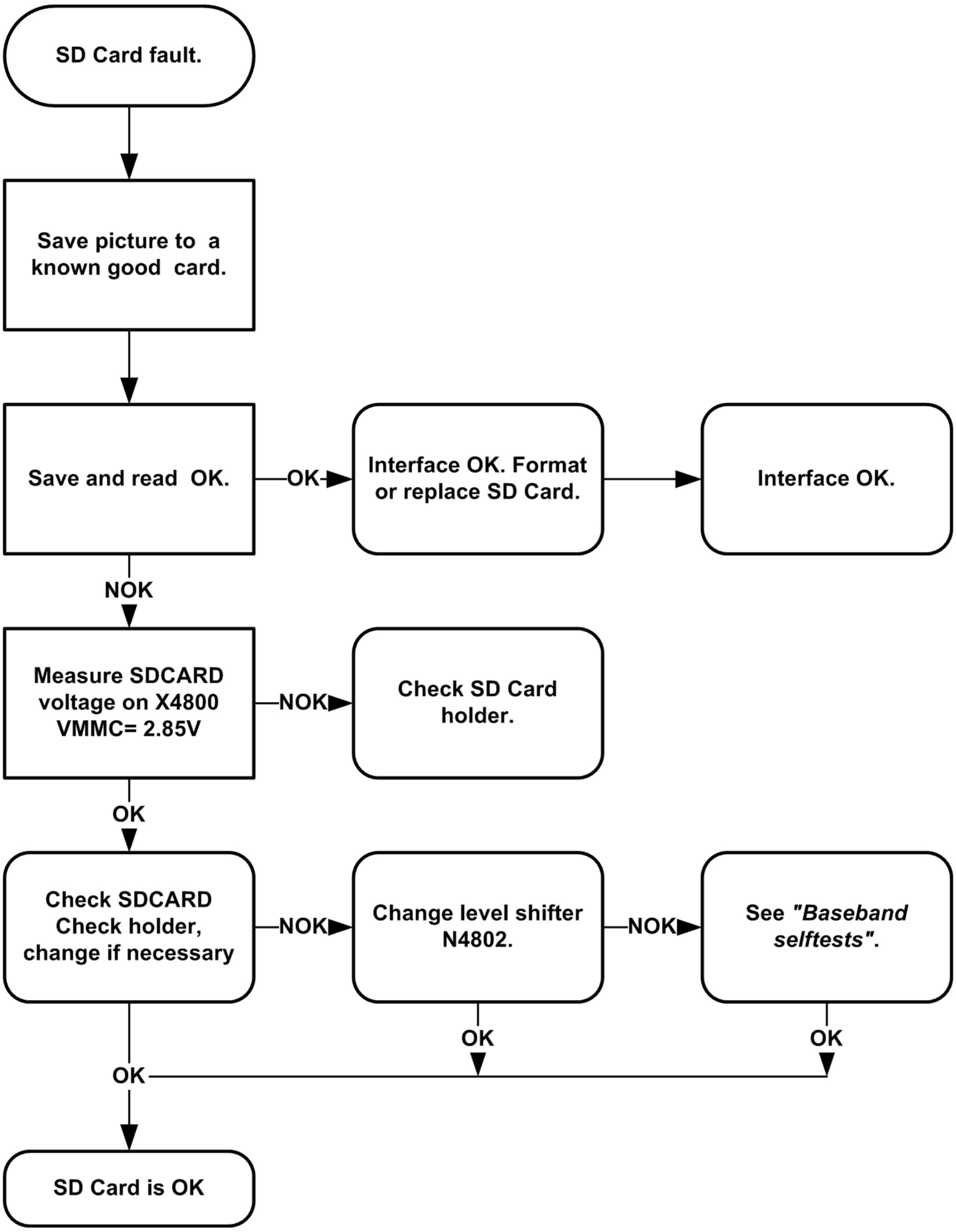
Combo memory troubleshooting

Troubleshooting flow


Memory fault
Measure Combo memory supply voltages VIO (C2810) and VDRAM (C2816). Both 1.8 V?
NOK
Check and replace C2213, C2215, C2216, C2217, C2220, C2222, C2227 if needed.
Measure Combo memory supply voltages VIO (C2810) and VDRAM (C2816). Both 1.8 V?
OK
Problem occurs while booting.
NOK
Go to "General power checking" troubleshooting.
Flash the phone if not done yet & retest
Measure Combo memory supply voltages VIO (C2810) and VDRAM (C2816). Both 1.8 V?
NOK
NOK
Swap engine module
End

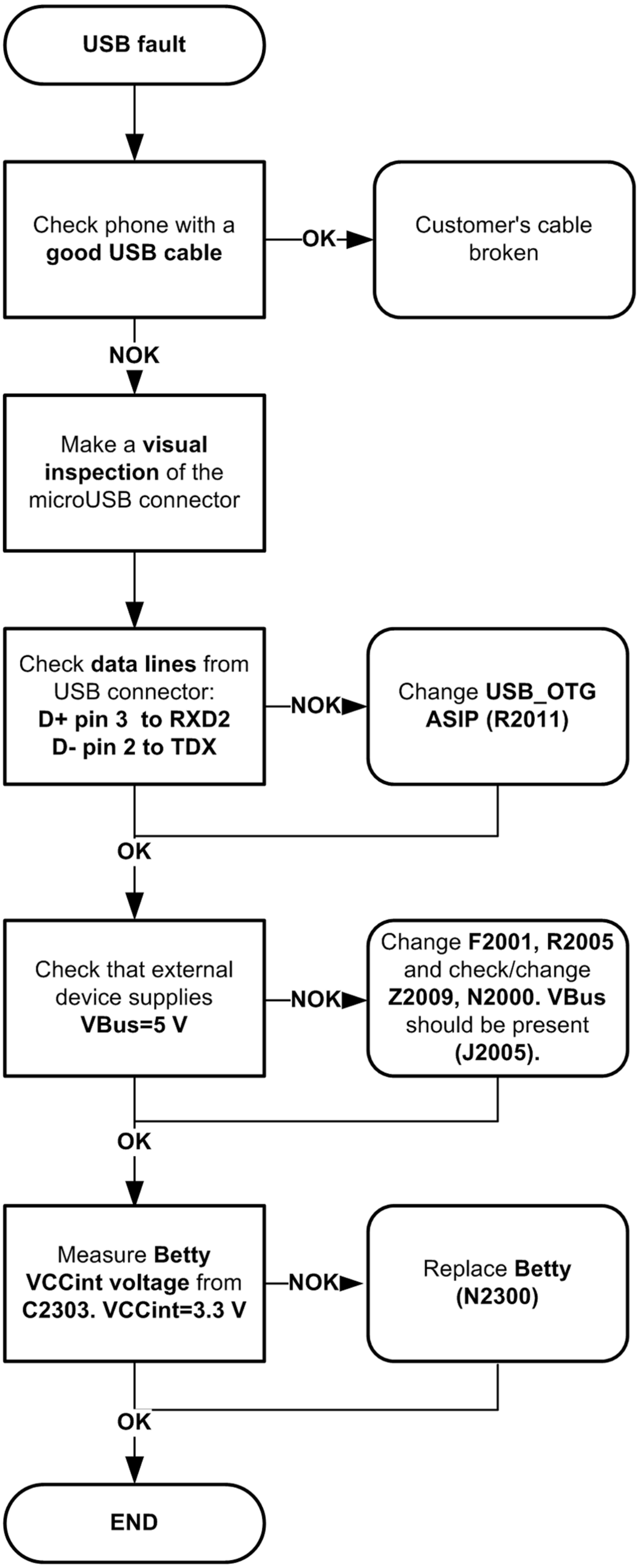
SD card troubleshooting

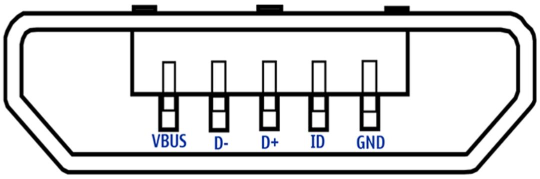
Troubleshooting flow


SD Card fault.
Save picture to a known good card.
Save and read OK.
OK
Interface OK. Format or replace SD Card.
Interface OK.
NOK
Measure SDCARD voltage on X4800 VMMC= 2.85V
NOK
Check SD Card holder.
OK
Check SDCARD Check holder, change if necessary
NOK
Change level shifter N4802.
NOK
See *"Baseband selftests"*.
OK
OK
OK
SD Card is OK

USB interface troubleshooting

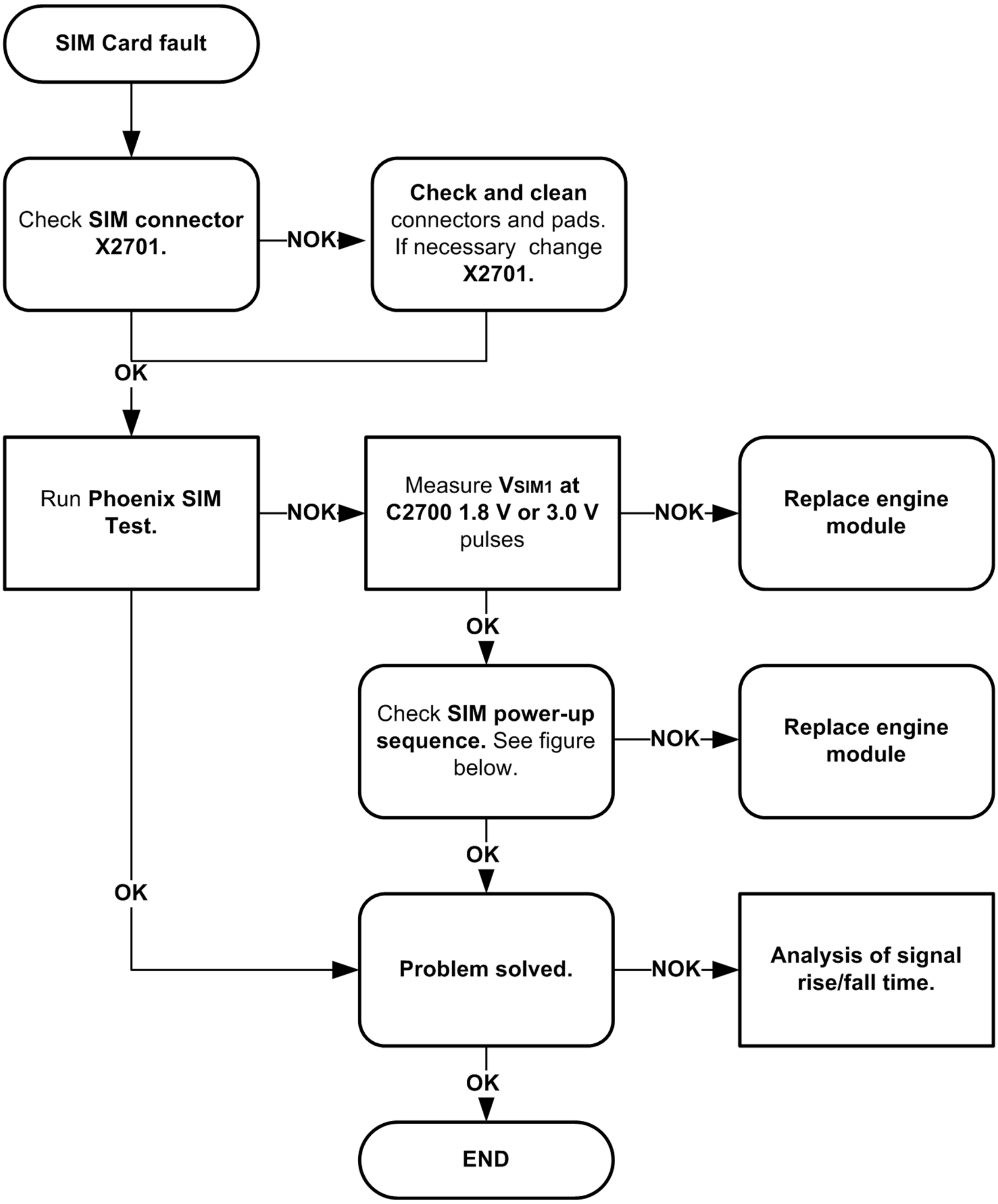
Troubleshooting flow


USB fault
Check phone with a **good USB cable**
OK
Customer's cable broken
NOK
Make a **visual inspection** of the microUSB connector
Check **data lines** from USB connector:
D+ pin 3 to RXD2
D- pin 2 to TDX
NOK
Change **USB_OTG ASIP (R2011)**
OK
Check that external device supplies **VBus=5 V**
NOK
Change **F2001, R2005** and check/change **Z2009, N2000. VBus** should be present **(J2005).**
OK
Measure **Betty VCCint voltage** from **C2303. VCCint=3.3 V**
NOK
Replace **Betty (N2300)**
OK
END


VBUS
D-
D+
ID
GND

SIM card troubleshooting

Troubleshooting flow


SIM Card fault
Check SIM connector X2701.
NOK
Check and clean connectors and pads. If necessary change X2701.
OK
Run Phoenix SIM Test.
NOK
Measure VSIM1 at C2700 1.8 V or 3.0 V pulses
NOK
Replace engine module
OK
Check SIM power-up sequence. See figure below.
NOK
Replace engine module
OK
OK
Problem solved.
NOK
Analysis of signal rise/fall time.
OK
END

User interface troubleshooting

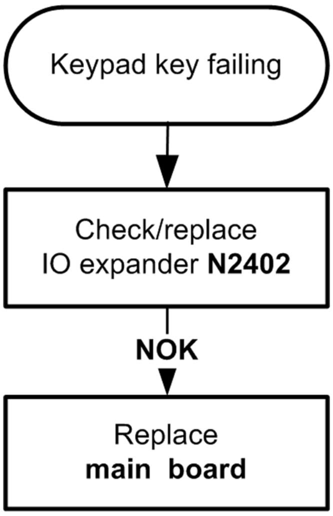
Keypad troubleshooting

Context

If one or more keys are stuck, so that the key does not react when a keydome key is pressed, the failure is caused by mechanical reasons (dirt, rust, mechanical damage, etc.)

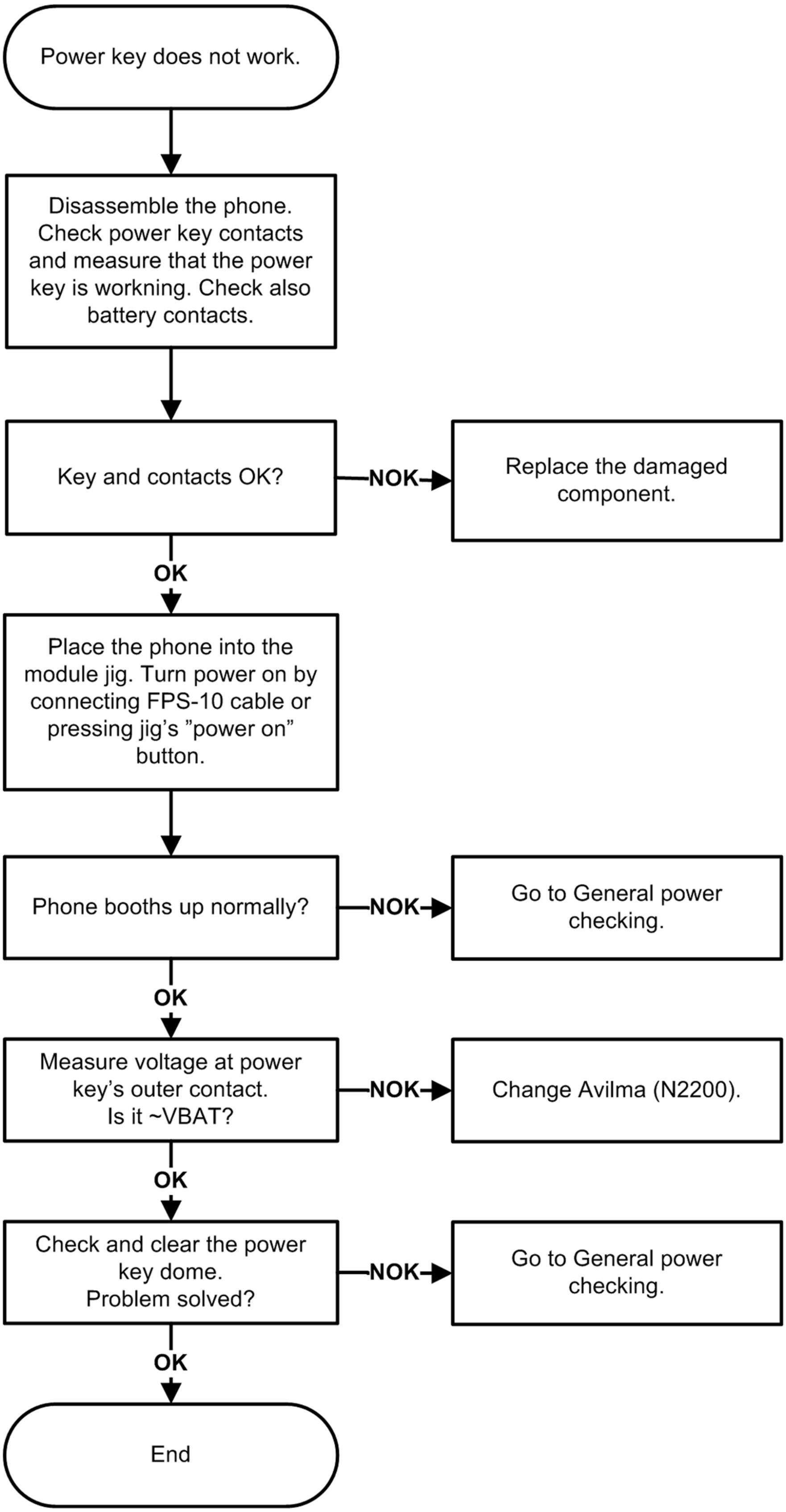
If the failure mode is not clear, start with the Keyboard test in Phoenix.

Troubleshooting flow


Keypad key failing
Check/replace IO expander N2402
NOK
Replace main board

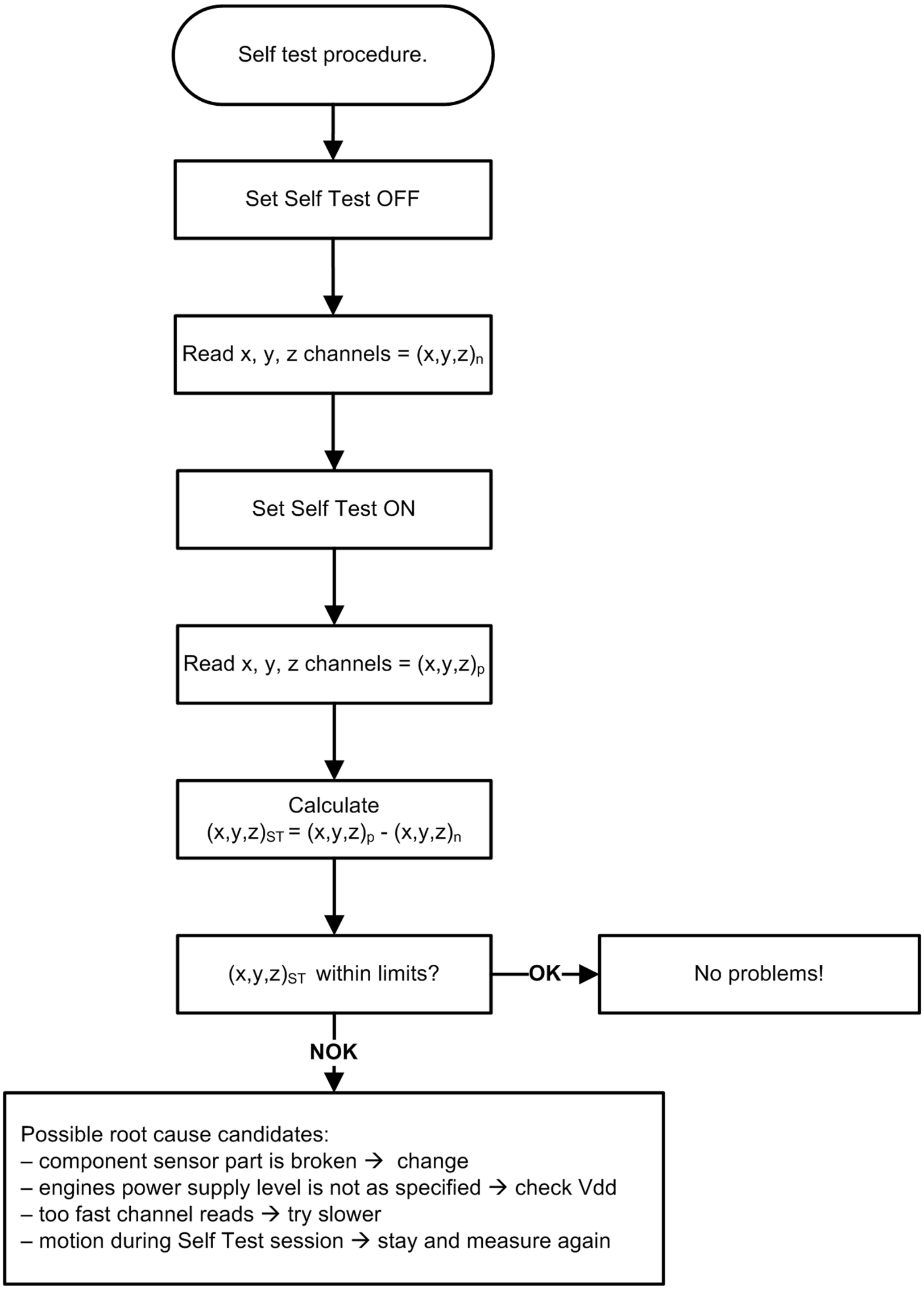
Power key troubleshooting

Troubleshooting flow


Power key does not work.
Disassemble the phone. Check power key contacts and measure that the power key is workning. Check also battery contacts.
Key and contacts OK?
NOK
Replace the damaged component.
OK
Place the phone into the module jig. Turn power on by connecting FPS-10 cable or pressing jig's ”power on” button.
Phone booths up normally?
NOK
Go to General power checking.
OK
Measure voltage at power key's outer contact. Is it ~VBAT?
NOK
Change Avilma (N2200).
OK
Check and clear the power key dome. Problem solved?
NOK
Go to General power checking.
OK
End

Accelerometer self test troubleshooting

Troubleshooting flow


Self test procedure.
Set Self Test OFF
Read x, y, z channels = $(x,y,z)_n$
Set Self Test ON
Read x, y, z channels = $(x,y,z)_p$
Calculate
$(x,y,z)_{ST} = (x,y,z)_p - (x,y,z)_n$
$(x,y,z)_{ST}$ within limits?
OK
No problems!
NOK

Possible root cause candidates:
– component sensor part is broken → change
– engines power supply level is not as specified → check Vdd
– too fast channel reads → try slower
– motion during Self Test session → stay and measure again

Display module troubleshooting

General instructions for display troubleshooting

Context

- The display is in a normal mode when the phone is in active use.
- Display is in a partial idle mode when the phone is in the screen saver mode.
- The operating modes of the display can be controlled with the help of *Phoenix*.

Table 8 Display module troubleshooting cases

Display blank	There is no image on the display. The display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.
Image on the display not correct	Image on the display can be corrupted or a part of the image can be missing. If a part of the image is missing, change the display module. If the image is otherwise corrupted, follow the appropriate troubleshooting diagram.
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. This means that in case the display is working (image OK), the backlight is faulty.
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the following table.

Table 9 Pixel defects

Item		White dot defect				Black dot defect	Total
1	Defect counts	R	G	B	White Dot Total	1	1
		1	1	1	1		
2	Combined defect counts	Not allowed. Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.					

Steps

1. Verify with a working display that the fault is not on the display module itself.

   The display module cannot be repaired.

2. Check that the cellular engine is working normally.
   - i To check the functionality, connect the phone to a docking station.
   - ii Start *Phoenix* service software.
   - iii Read the phone information to check that also the application engine is functioning normally (you should be able to read the APE ID).

3. Proceed to the display troubleshooting flowcharts.

   Use the **Display Test** tool in *Phoenix* to find the detailed fault mode.

Display troubleshooting

Context

There are three different display fault cases;

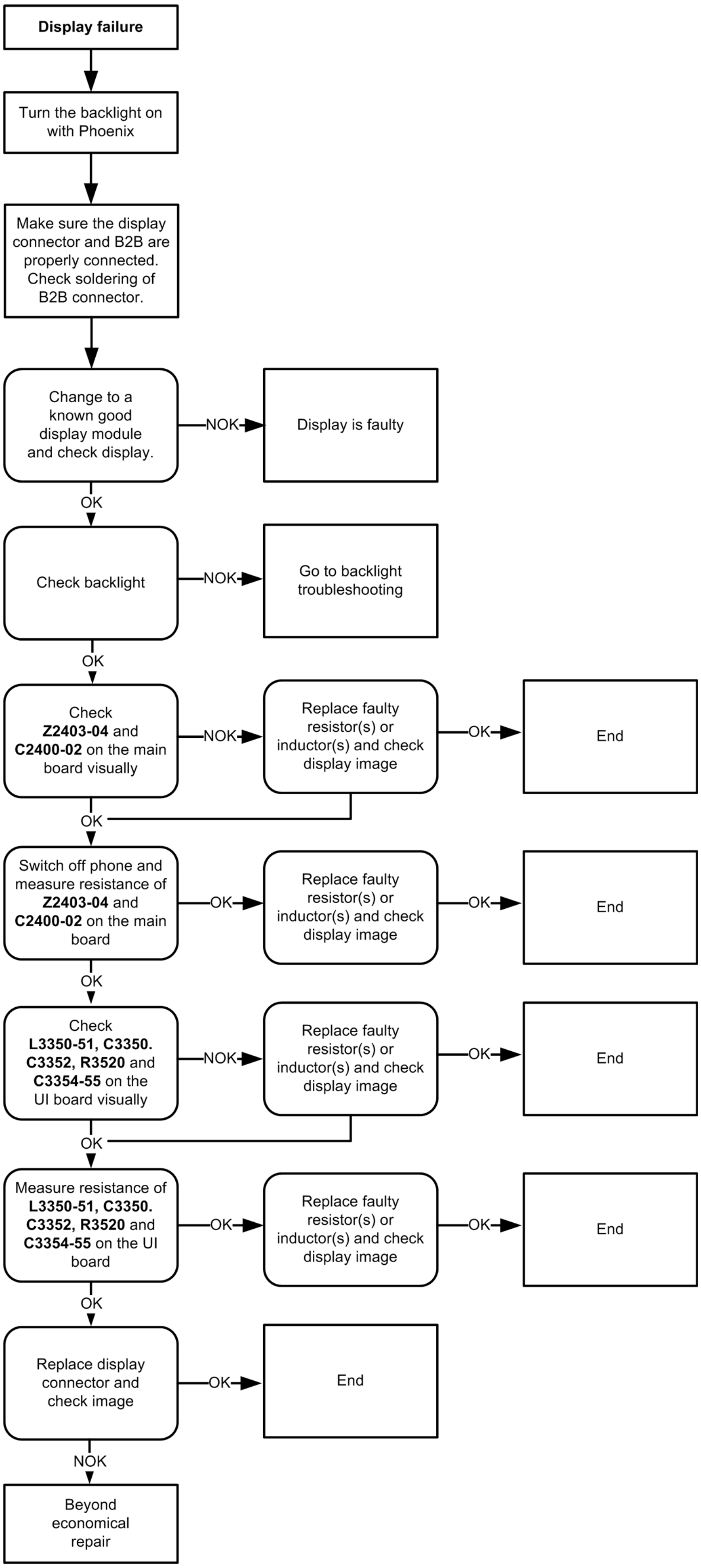
1 No backlights when image is on

2 No image when backlight is on

3 No backlight and no image

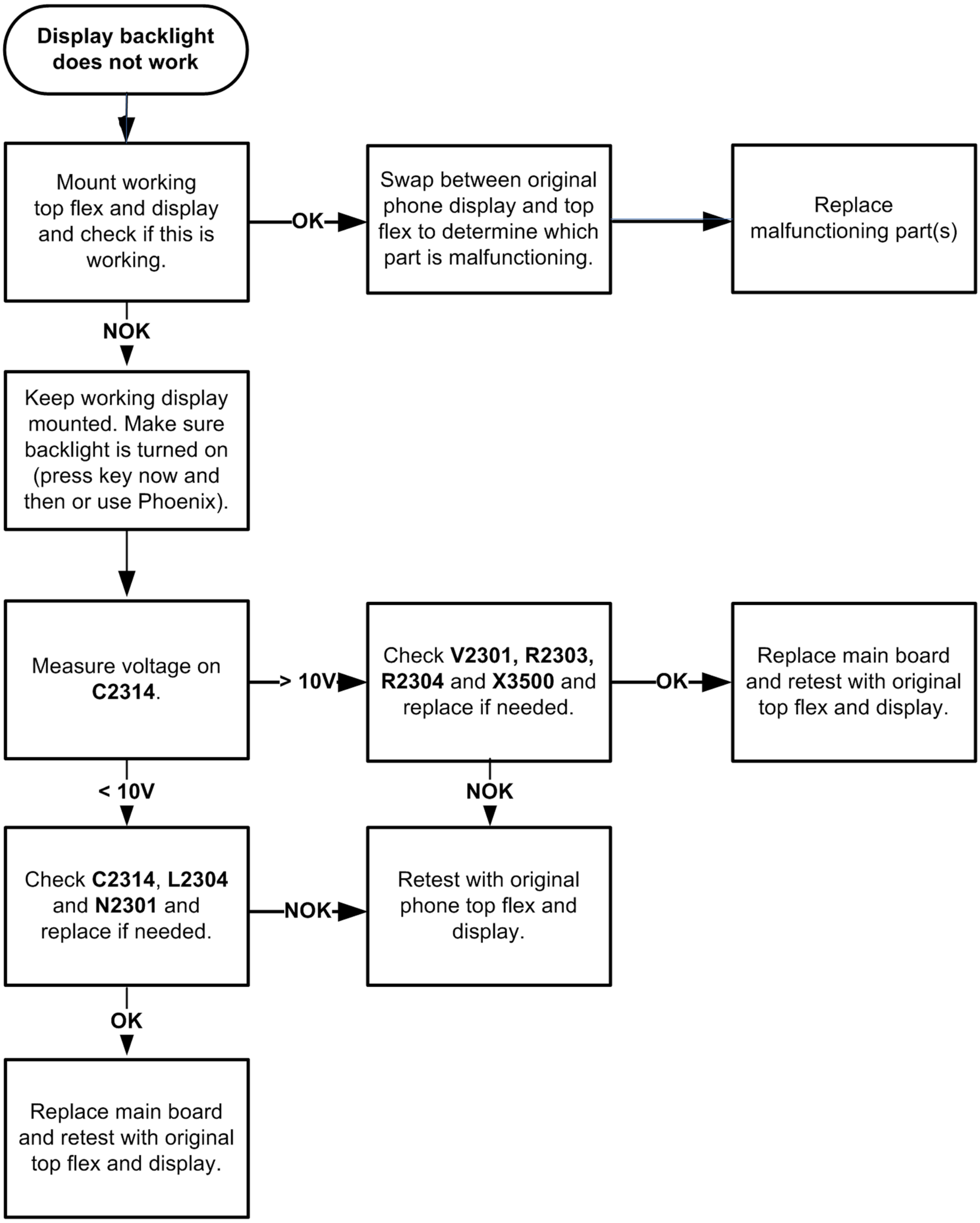
> **Note:** When assembling/disassembling the phone, all grounding contacts between different levels (display, display flex, display frame, BTBI connector) must be checked in order to have them properly connected.

Troubleshooting flow


Display failure
Turn the backlight on with Phoenix
Make sure the display connector and B2B are properly connected. Check soldering of B2B connector.
Change to a known good display module and check display.
NOK
Display is faulty
OK
Check backlight
NOK
Go to backlight troubleshooting
OK
Check Z2403-04 and C2400-02 on the main board visually
NOK
Replace faulty resistor(s) or inductor(s) and check display image
OK
End
OK
Switch off phone and measure resistance of Z2403-04 and C2400-02 on the main board
OK
Replace faulty resistor(s) or inductor(s) and check display image
OK
End
OK
Check L3350-51, C3350. C3352, R3520 and C3354-55 on the UI board visually
NOK
Replace faulty resistor(s) or inductor(s) and check display image
OK
End
OK
Measure resistance of L3350-51, C3350. C3352, R3520 and C3354-55 on the UI board
OK
Replace faulty resistor(s) or inductor(s) and check display image
OK
End
OK
Replace display connector and check image
OK
End
NOK
Beyond economical repair

Display backlight troubleshooting

Troubleshooting flow


Display backlight does not work
Mount working top flex and display and check if this is working.
OK
Swap between original phone display and top flex to determine which part is malfunctioning.
Replace malfunctioning part(s)
NOK
Keep working display mounted. Make sure backlight is turned on (press key now and then or use Phoenix).
Measure voltage on C2314.
> 10V
Check V2301, R2303, R2304 and X3500 and replace if needed.
OK
Replace main board and retest with original top flex and display.
< 10V
NOK
Check C2314, L2304 and N2301 and replace if needed.
NOK
Retest with original phone top flex and display.
OK
Replace main board and retest with original top flex and display.

Ambient light sensor (ALS) troubleshooting

Prerequisites

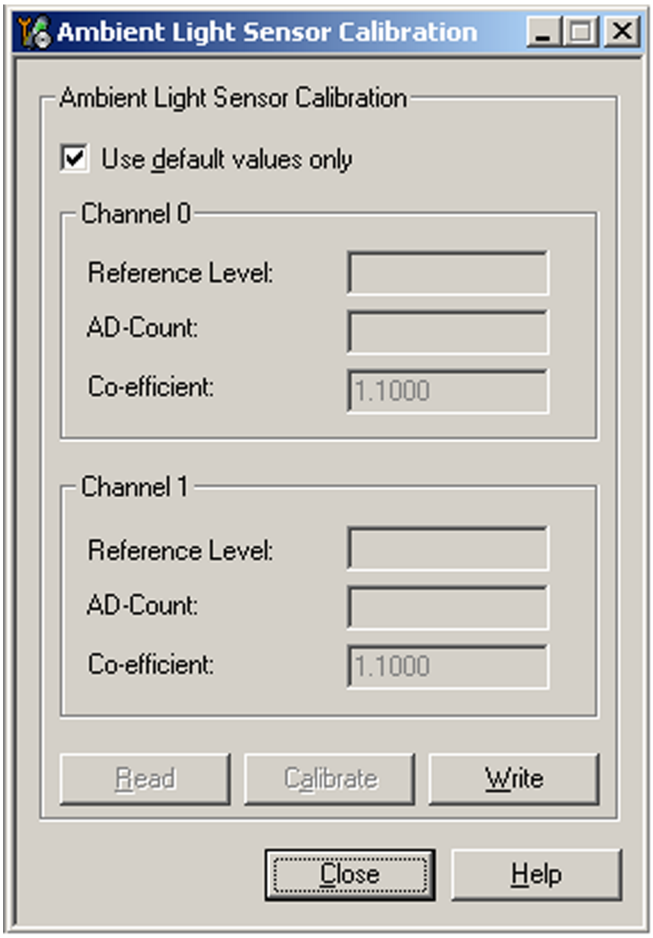
Make sure that you have completed the *Keyboard backlight troubleshooting* before continuing with the ALS troubleshooting.

Context

If ALS chip is broken replace it with Greymon ALS chip. If calibration values are lost (e.g. after replacing the memory chip) or if the ALS chip is replaced, the calibration values in the phone memory has to be changed to the default value: 1.

Phoenix has an ALS calibration tool for changing calibration values and it’s done following way:

1. Open Phoenix
2. Connect phone and build up connection
3. Open **Tools→Ambient Light Sensor calibration** window
4. Ensure that **Use default values only** flag is set
5. Click **Write**

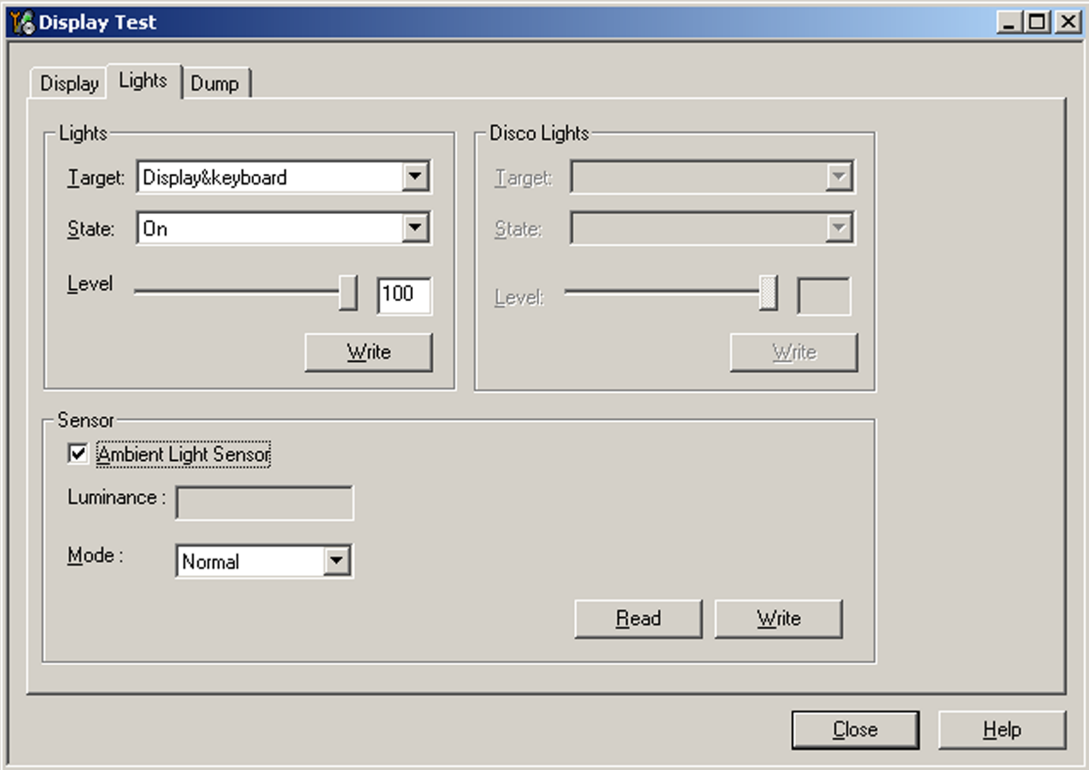

Ambient Light Sensor Calibration
Ambient Light Sensor Calibration
Channel 0
Reference Level:
AD-Count:
Channel 1
Reference Level:
AD-Count:
Read
Calibrate
Write
Close
Help

☑ Use default values only

Channel 0 Co-efficient: 1.1000

Channel 1 Co-efficient: 1.1000

Figure 10 Ambient light sensor calibration window


Display Test
Display
Lights
Dump
Lights
Disco Lights
Target:
State:
Level:
Write
Write
Sensor
Luminance :
Read
Write
Close
Help

Target: Display&keyboard

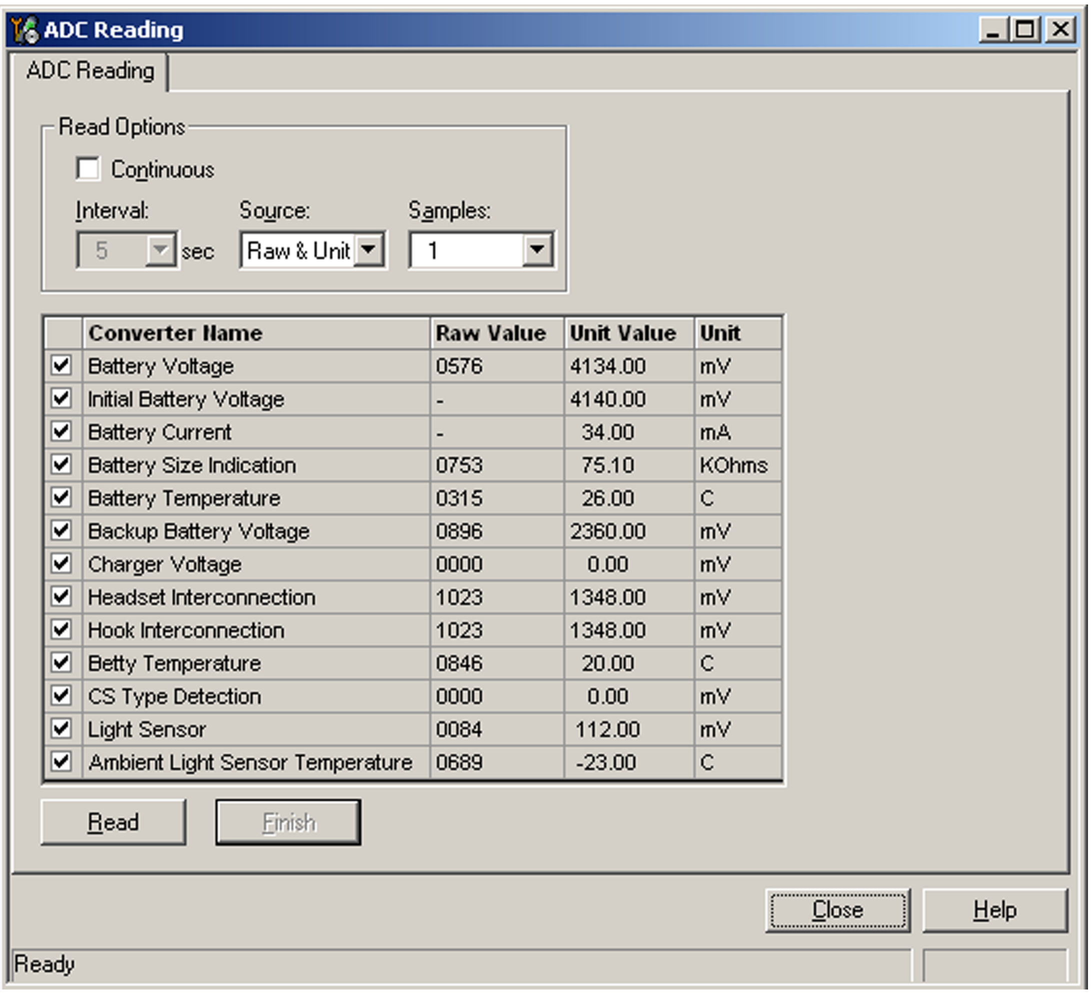
State: On

Level 100

☑ Ambient Light Sensor

Mode : Normal

Figure 11 Display test



☐ Continuous

Interval: 5 sec

Source: Raw & Unit

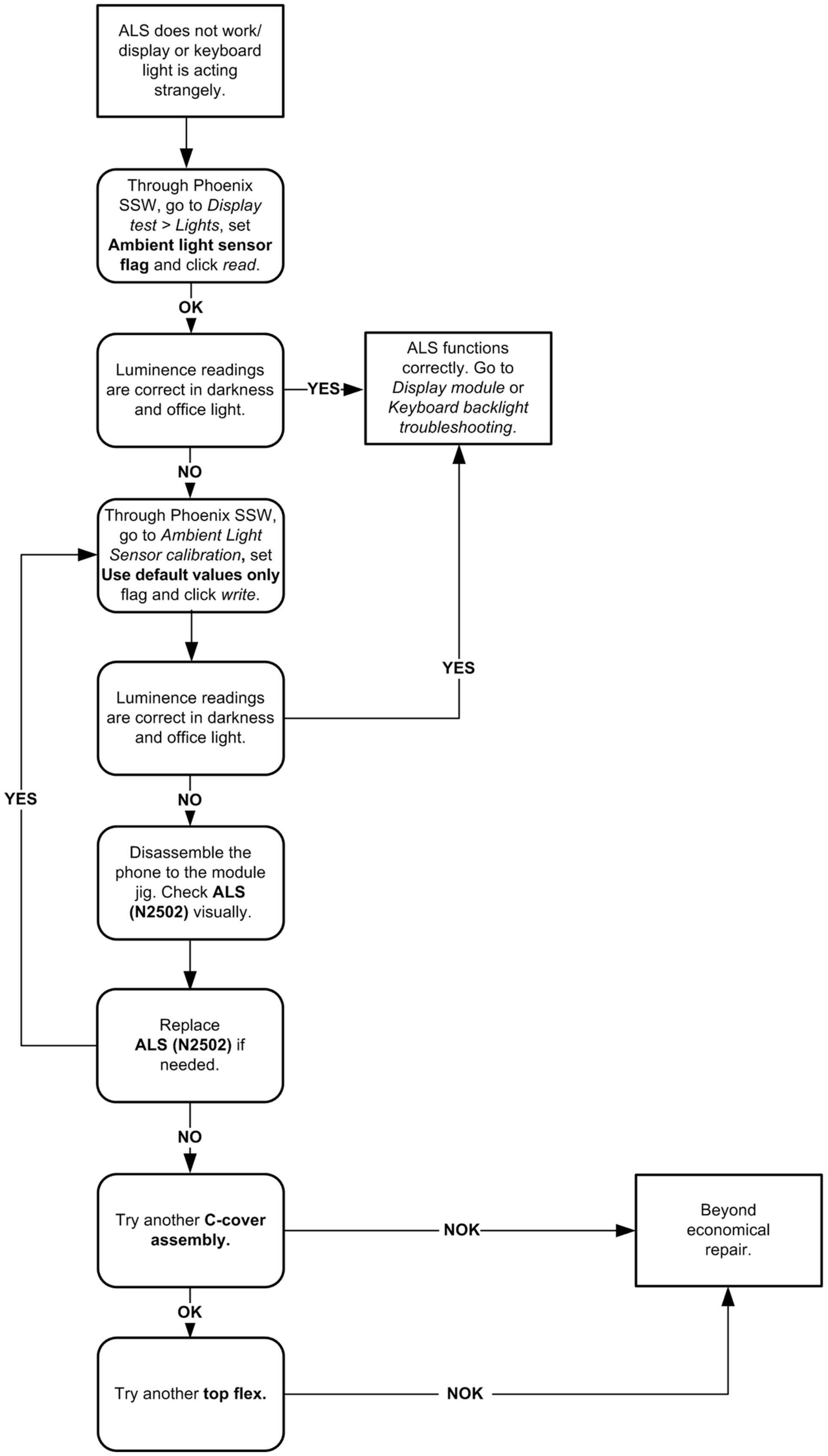
Samples: 1

	Converter Name	Raw Value	Unit Value	Unit
☑	Battery Voltage	0576	4134.00	mV
☑	Initial Battery Voltage	-	4140.00	mV
☑	Battery Current	-	34.00	mA
☑	Battery Size Indication	0753	75.10	KOhms
☑	Battery Temperature	0315	26.00	C
☑	Backup Battery Voltage	0896	2360.00	mV
☑	Charger Voltage	0000	0.00	mV
☑	Headset Interconnection	1023	1348.00	mV
☑	Hook Interconnection	1023	1348.00	mV
☑	Betty Temperature	0846	20.00	C
☑	CS Type Detection	0000	0.00	mV
☑	Light Sensor	0084	112.00	mV
☑	Ambient Light Sensor Temperature	0689	-23.00	C

Ready

Figure 12 ADC readings

Troubleshooting flow


ALS does not work/ display or keyboard light is acting strangely.
Through Phoenix SSW, go to *Display test > Lights*, set **Ambient light sensor flag** and click *read*.
OK
Luminence readings are correct in darkness and office light.
YES
ALS functions correctly. Go to *Display module* or *Keyboard backlight troubleshooting*.
NO
Through Phoenix SSW, go to *Ambient Light Sensor calibration*, set **Use default values only** flag and click *write*.
Luminence readings are correct in darkness and office light.
YES
NO
YES
Disassemble the phone to the module jig. Check **ALS (N2502)** visually.
Replace **ALS (N2502)** if needed.
NO
Try another **C-cover assembly.**
NOK
Beyond economical repair.
OK
Try another **top flex.**
NOK

Camera module troubleshooting

Introduction to camera troubleshooting

Bad conditions often cause bad pictures. Therefore, the camera operation has to be checked in constant conditions or by using a second, known-to-be-good Nokia device as reference. Image quality is hard to measure quantitatively, and the difference between a good and a bad picture can be small. Some training or experience may be needed to detect what is actually wrong.

When checking for possible errors in camera functionality, knowing what error is suspected significantly helps the testing by narrowing down the amount of test cases. The following types of image quality problems are common:

- Dust (black spots)
- Lack of sharpness
- Bit errors

Main (back) camera troubleshooting

Taking and evaluating test pictures with main camera

When *taking* a test picture, remember the following:

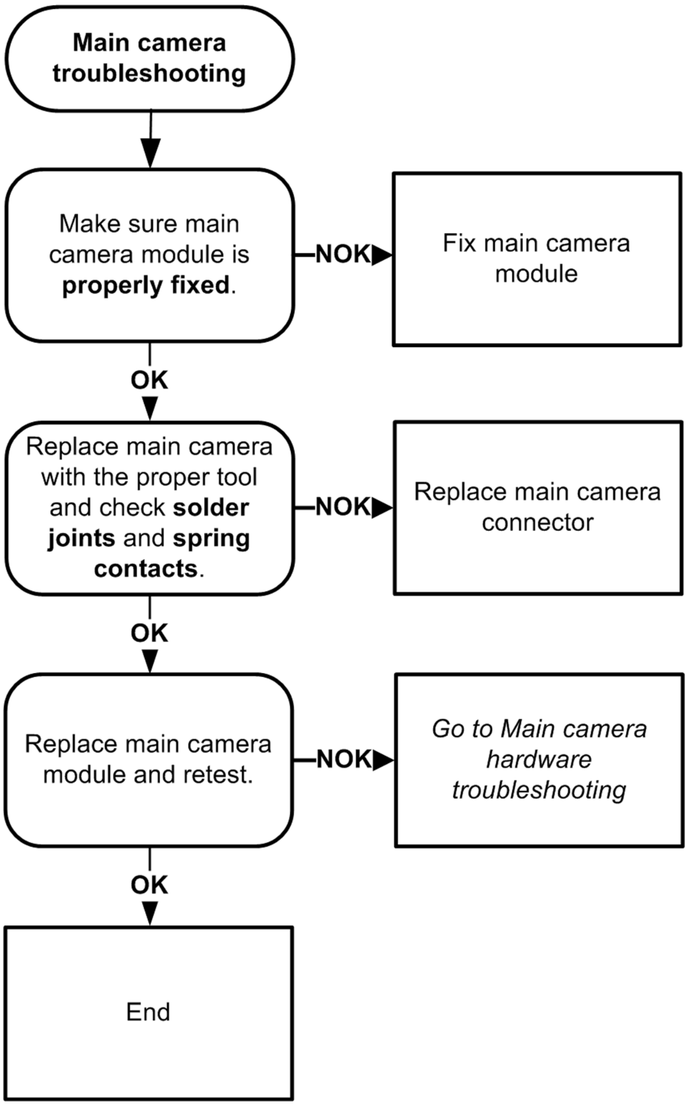
- Avoid bright fluorescent light, 50/60Hz electrical network or high artificial illumination levels
- If the phone is hot, let it rest for a while before taking the picture
- Make sure the optical system is clean
- Use highest possible resolution
- Make sure the light is sufficient (bright office lightning)
- Do not take the picture towards a light source
- Hold the phone as still as possible when taking the picture
- If camera has auto focus: Pictures should be taken both at infinity ~>2m and at macro distance ~10-15 cm in order to verify auto focus functionality

When *evaluating* a test picture, remember the following:

- The center of the picture is sharper than the edges
- The image may be blurred, though it does not show in the viewfinder
- Analyse the picture from your PC monitor, full colour setting is recommended
- If possible, compare with a picture of the same motive taken with a similar Nokia device
- If camera has auto focus: Remember that the white focussing frame which appears when the camera button is pressed halfway down, must turn green for auto focus lock. If the frame turns red, the camera is not focussed!

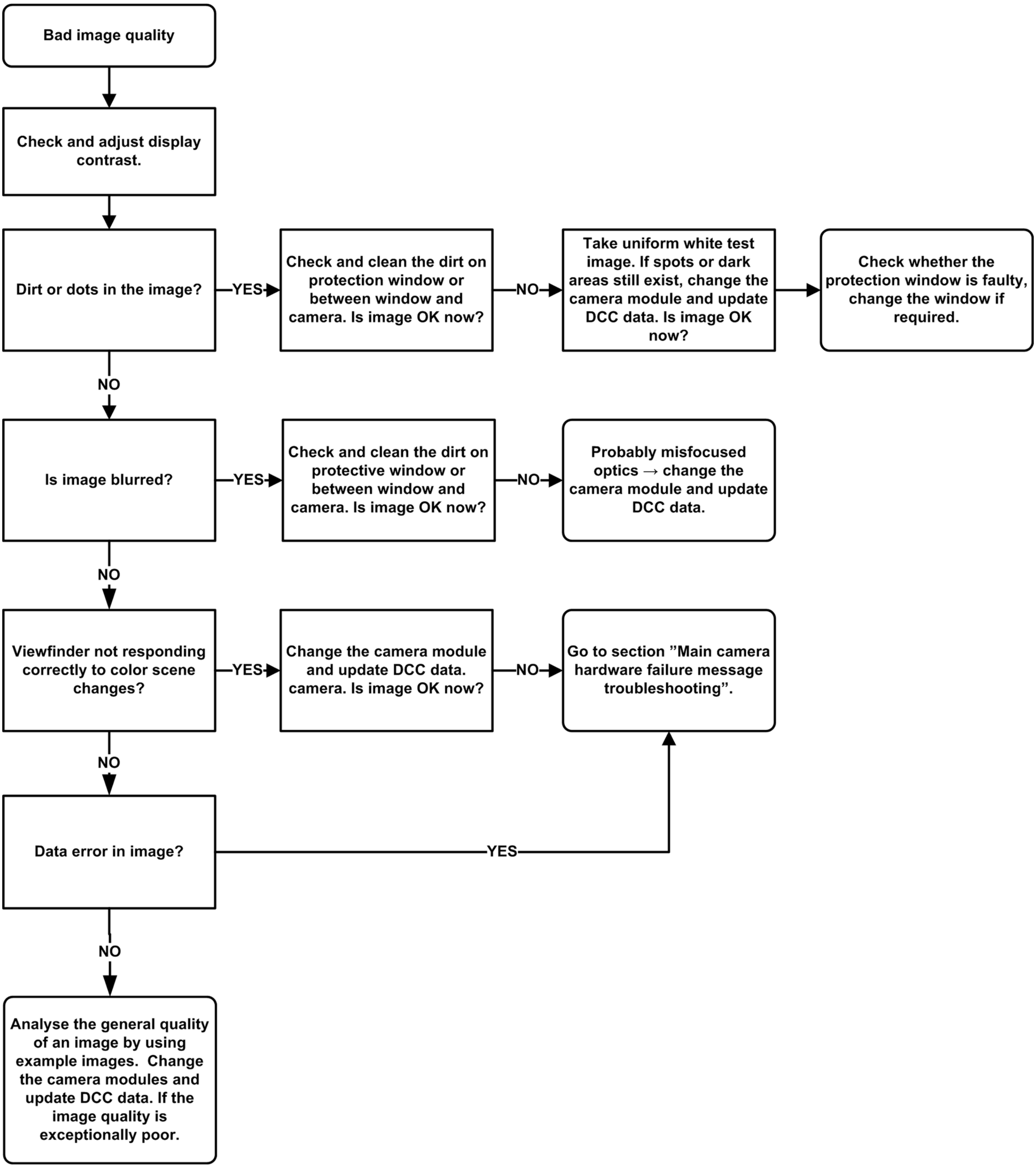
Main camera troubleshooting

Troubleshooting flow


Main camera troubleshooting
Make sure main camera module is properly fixed.
NOK
Fix main camera module
OK
Replace main camera with the proper tool and check solder joints and spring contacts.
NOK
Replace main camera connector
OK
Replace main camera module and retest.
NOK
Go to Main camera hardware troubleshooting
OK
End

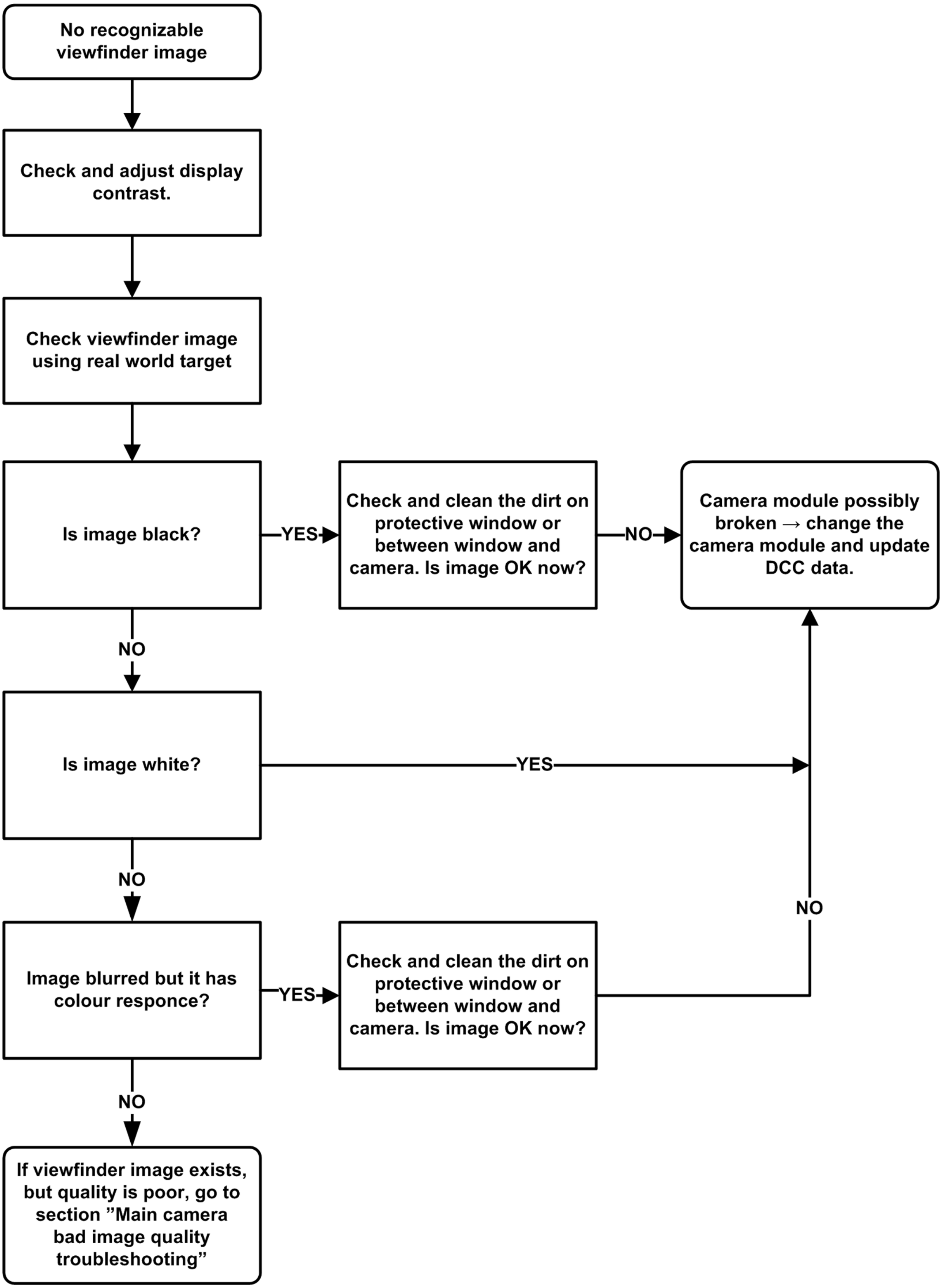
Main camera bad image quality troubleshooting

Troubleshooting flow


Bad image quality
Check and adjust display contrast.
Dirt or dots in the image?
YES
Check and clean the dirt on protection window or between window and camera. Is image OK now?
NO
Take uniform white test image. If spots or dark areas still exist, change the camera module and update DCC data. Is image OK now?
Check whether the protection window is faulty, change the window if required.
NO
Is image blurred?
YES
Check and clean the dirt on protective window or between window and camera. Is image OK now?
NO
Probably misfocused optics → change the camera module and update DCC data.
NO
Viewfinder not responding correctly to color scene changes?
YES
Change the camera module and update DCC data. camera. Is image OK now?
NO
Go to section ”Main camera hardware failure message troubleshooting”.
NO
Data error in image?
YES
NO
Analyse the general quality of an image by using example images. Change the camera modules and update DCC data. If the image quality is exceptionally poor.

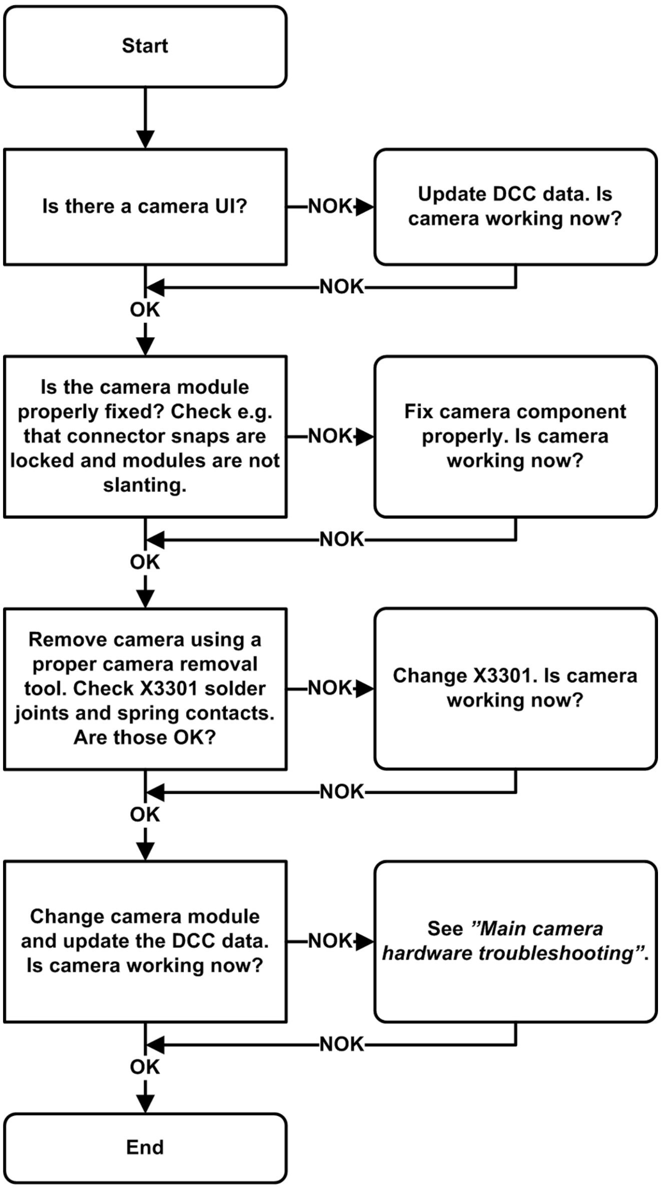
Main camera viewfinder troubleshooting

Troubleshooting flow


No recognizable viewfinder image
Check and adjust display contrast.
Check viewfinder image using real world target
Is image black?
YES
Check and clean the dirt on protective window or between window and camera. Is image OK now?
NO
Camera module possibly broken → change the camera module and update DCC data.
NO
Is image white?
YES
NO
Image blurred but it has colour responce?
YES
Check and clean the dirt on protective window or between window and camera. Is image OK now?
NO
NO
If viewfinder image exists, but quality is poor, go to section "Main camera bad image quality troubleshooting"

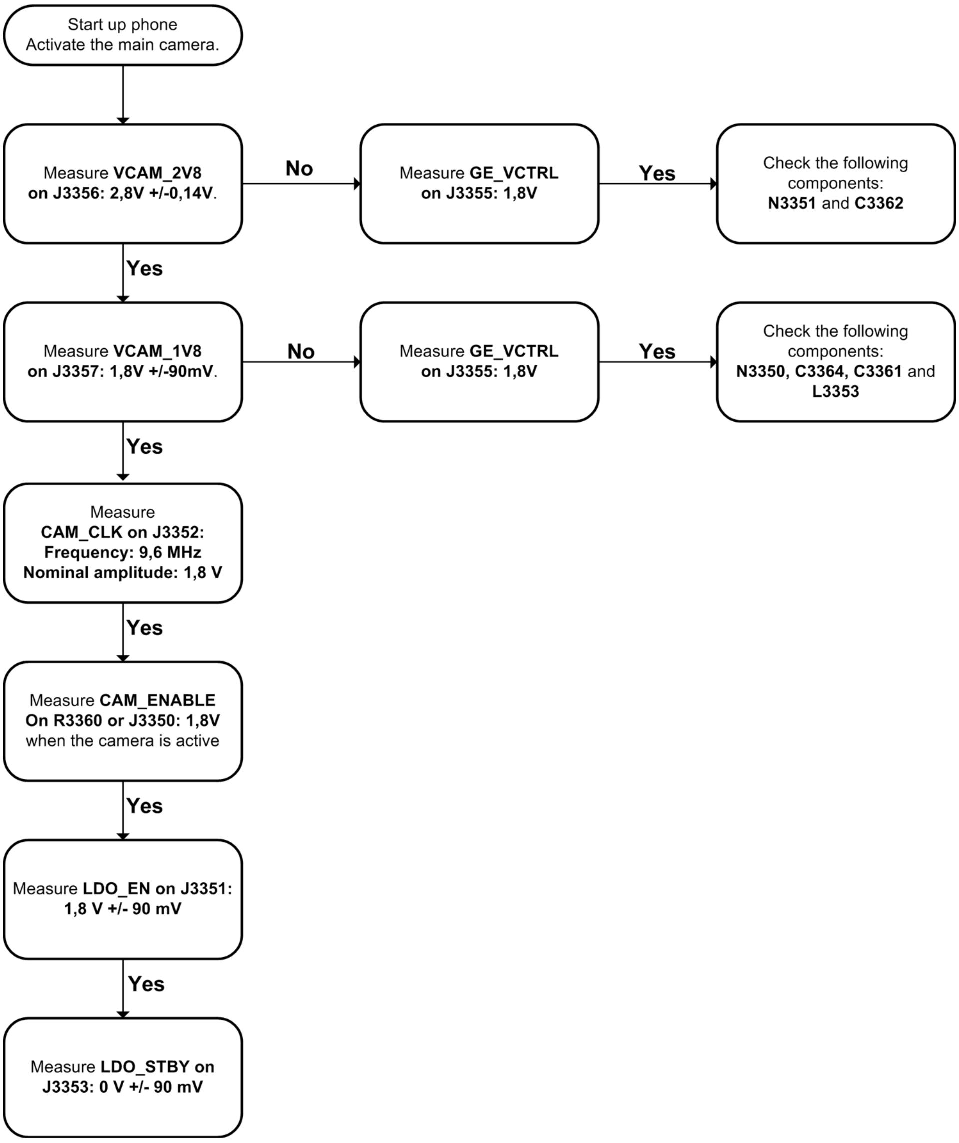
Main camera hardware failure message troubleshooting

Troubleshooting flow


Start
Is there a camera UI?
NOK
Update DCC data. Is camera working now?
NOK
OK
Is the camera module properly fixed? Check e.g. that connector snaps are locked and modules are not slanting.
NOK
Fix camera component properly. Is camera working now?
NOK
OK
Remove camera using a proper camera removal tool. Check X3301 solder joints and spring contacts. Are those OK?
NOK
Change X3301. Is camera working now?
NOK
OK
Change camera module and update the DCC data. Is camera working now?
NOK
See *"Main camera hardware troubleshooting"*.
NOK
OK
End

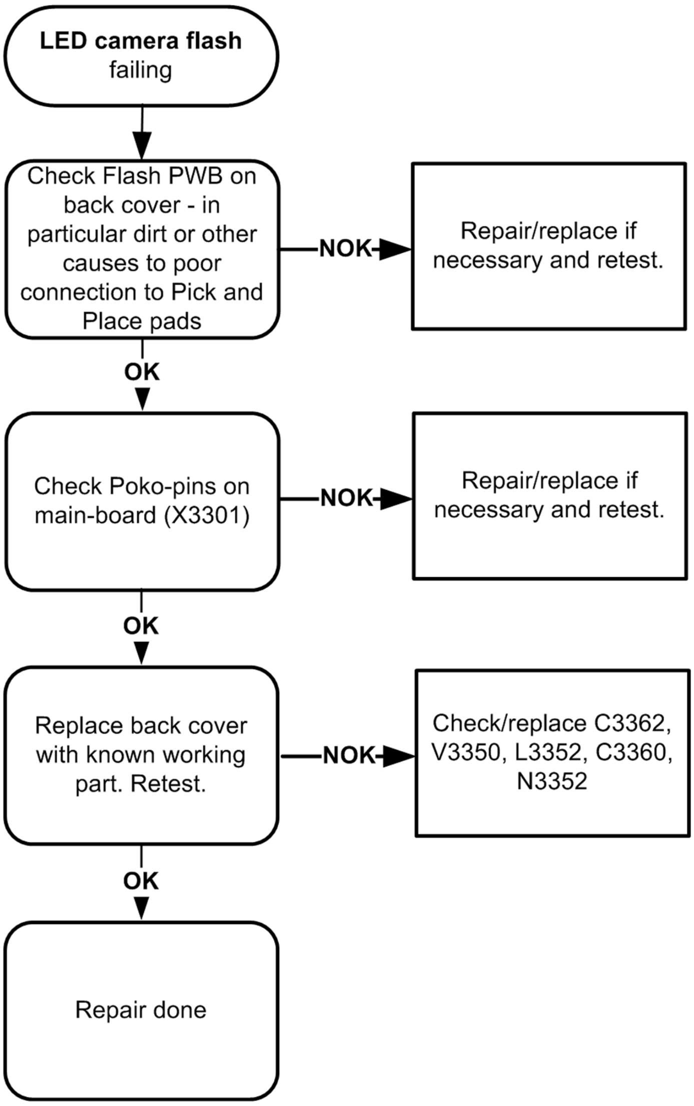
Main camera hardware troubleshooting

Troubleshooting flow


Start up phone
Activate the main camera.
Measure **VCAM_2V8 on J3356: 2,8V +/-0,14V**.
No
Measure **GE_VCTRL on J3355: 1,8V**
Yes
Check the following components:
N3351 and **C3362**
Yes
Measure **VCAM_1V8 on J3357: 1,8V +/-90mV**.
No
Measure **GE_VCTRL on J3355: 1,8V**
Yes
Check the following components:
N3350, C3364, C3361 and **L3353**
Yes
Measure
CAM_CLK on J3352:
Frequency: 9,6 MHz
Nominal amplitude: 1,8 V
Yes
Measure **CAM_ENABLE On R3360 or J3350: 1,8V** when the camera is active
Yes
Measure **LDO_EN on J3351: 1,8 V +/- 90 mV**
Yes
Measure **LDO_STBY on J3353: 0 V +/- 90 mV**

LED camera flash troubleshooting

Troubleshooting flow


LED camera flash failing
Check Flash PWB on back cover - in particular dirt or other causes to poor connection to Pick and Place pads
NOK
Repair/replace if necessary and retest.
OK
Check Poko-pins on main-board (X3301)
NOK
Repair/replace if necessary and retest.
OK
Replace back cover with known working part. Retest.
NOK
Check/replace C3362, V3350, L3352, C3360, N3352
OK
Repair done

Secondary (front) camera troubleshooting

Evaluating videocall picture quality from secondary camera

When testing the picture quality of a videocall, remember the following:

- Avoid bright fluorescent light, 50/60Hz electrical network or high artificial illumination levels
- Make sure the optical system is clean
- Make sure the light is suffiecient (bright office lightning)
- Do not take the picture towards light source
- Hold the phone as still as possible when evaluating the video call image quality.
- Distance should be approximately 40 cm

When *evaluating* the picture quality of a video call, remember the following:

> **Note:** Always use the "troubled" phone when evaluating a picture in a video call. Do not evaluate the picture on the receiving phone.

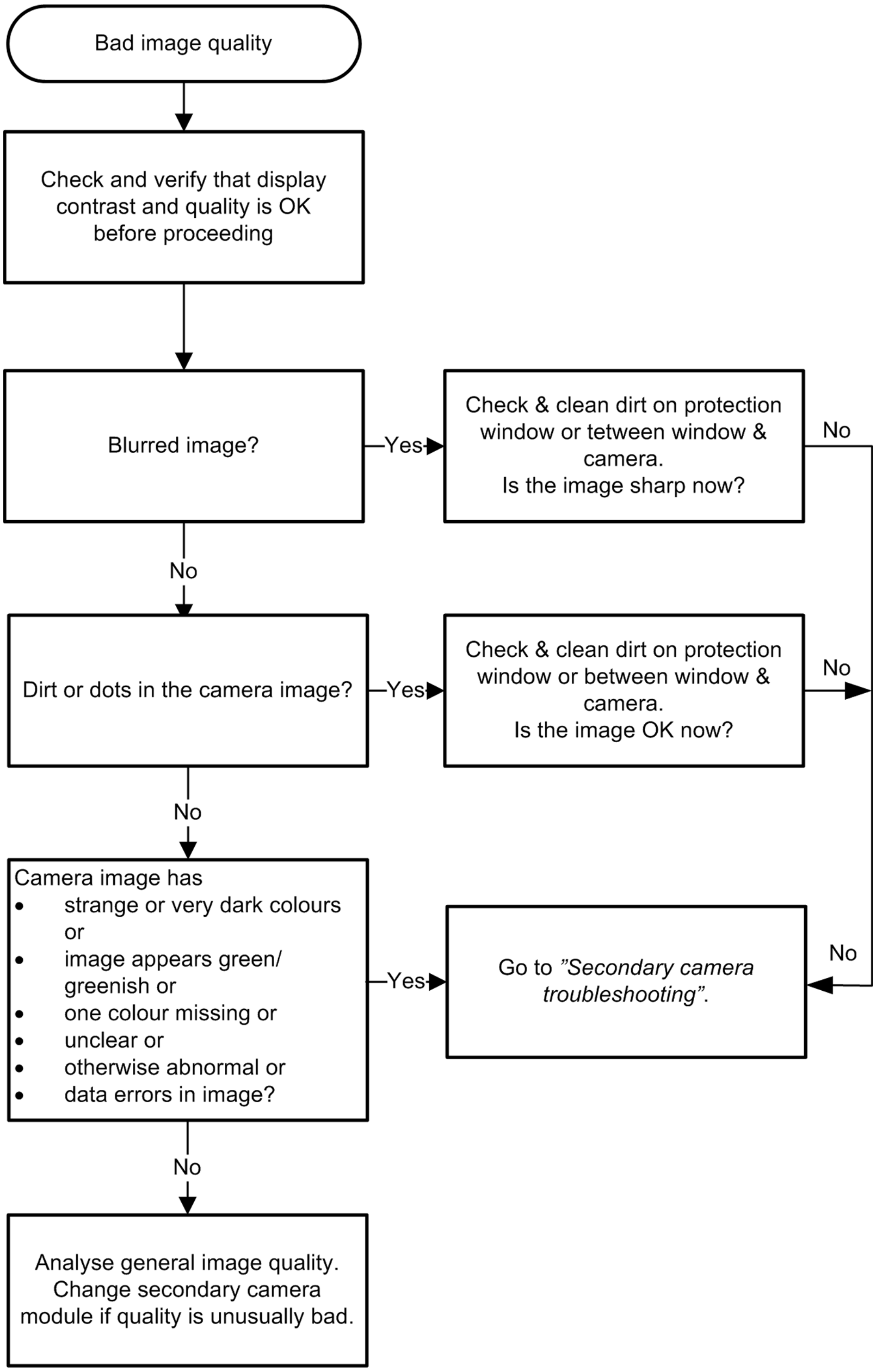
- The center of the picture is sharper than the edges
- If possible, compare with the picture on another Nokia device in a videocall, and of the same motive.

Secondary camera bad image quality troubleshooting

Troubleshooting flow

***Note**: Phone must be in a video call for the front camera to be active.*

***Note:** Always use the "troubled" phone when evaluating a picture in a video call. Do not evaluate the picture on the receiving phone.*

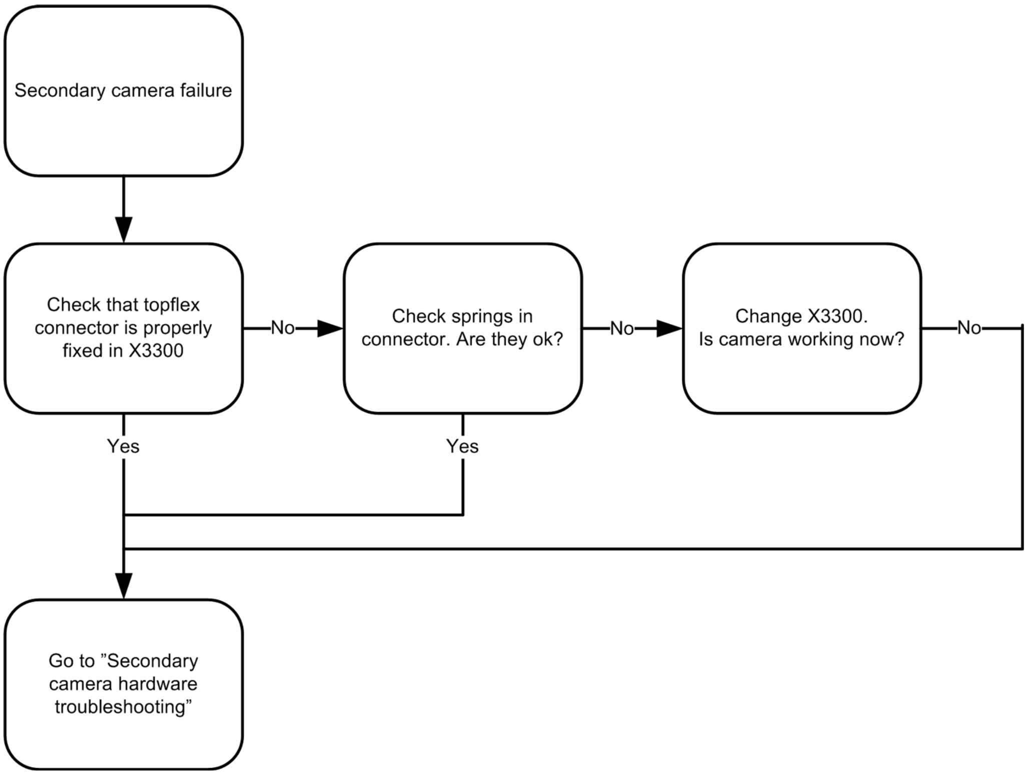

Bad image quality
Check and verify that display contrast and quality is OK before proceeding
Blurred image?
Yes
Check & clean dirt on protection window or tetween window & camera.
Is the image sharp now?
No
No
Dirt or dots in the camera image?
Yes
Check & clean dirt on protection window or between window & camera.
Is the image OK now?
No
No
Camera image has
strange or very dark colours or
image appears green/ greenish or
one colour missing or
unclear or
otherwise abnormal or
data errors in image?
Yes
Go to "Secondary camera troubleshooting".
No
No
Analyse general image quality. Change secondary camera module if quality is unusually bad.

Secondary camera troubleshooting

Troubleshooting flow

Note: Phone must be in a video call for the front camera to be active.

Note: Always use the "troubled" phone when evaluating a picture in a video call. Do not evaluate the picture on the receiving phone.

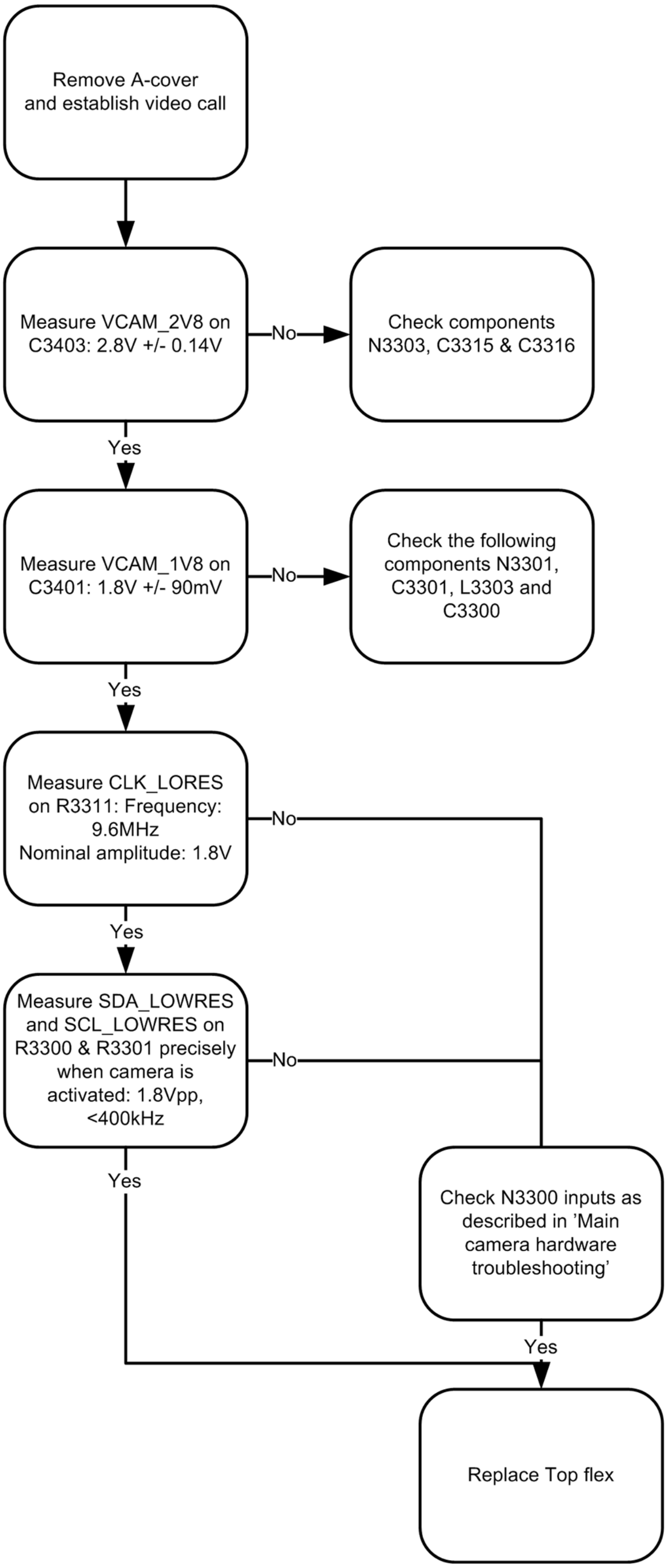

Secondary camera failure
Check that topflex connector is properly fixed in X3300
No
Check springs in connector. Are they ok?
No
Change X3300. Is camera working now?
No
Yes
Yes
Go to "Secondary camera hardware troubleshooting"

Secondary camera hardware troubleshooting

Troubleshooting flow

Note: Phone must be in a video call for the front camera to be active.

Note: Always use the "troubled" phone when evaluating a picture in a video call. Do not evaluate the picture on the receiving phone.


Remove A-cover and establish video call
Measure VCAM_2V8 on C3403: 2.8V +/- 0.14V
No
Check components N3303, C3315 & C3316
Yes
Measure VCAM_1V8 on C3401: 1.8V +/- 90mV
No
Check the following components N3301, C3301, L3303 and C3300
Yes
Measure CLK_LORES on R3311: Frequency: 9.6MHz Nominal amplitude: 1.8V
No
Yes
Measure SDA_LOWRES and SCL_LOWRES on R3300 & R3301 precisely when camera is activated: 1.8Vpp, <400kHz
No
Yes
Check N3300 inputs as described in 'Main camera hardware troubleshooting'
Yes
Replace Top flex

Audio troubleshooting

Audio troubleshooting test instructions

Differential external earpiece and internal earpiece outputs can be measured either with a single-ended or a differential probe.

When measuring with a single-ended probe each output is measured against the ground.

Internal handsfree output is measured using a current probe, if a special low-pass filter designed for measuring a digital amplifier is not available. Note also that when using a current probe, the input signal frequency must be set to 2kHz.

The input signal for each loop test can be either single-ended or differential.

Required equipment

The following equipment is needed for the tests:

- Oscilloscope
- Function generator (sine waveform)
- 'Active speaker' or 'speaker and power amplifier'
- Sound level meter
- Current probe (Internal handsfree DPMA output measurement)
- Phoenix service software
- Battery voltage 3.7V

Test procedure

Audio can be tested using the Phoenix audio routings option. Three different audio loop paths can be activated:

- External microphone to Internal earpiece
- External microphone to Internal handsfree speaker
- Internal microphone to External earpiece

Each audio loop sets routing from the specified input to the specified output enabling a quick in-out test. Loop path gains are fixed and they cannot be changed using Phoenix. Correct pins and signals for each test are presented in the following table.

Phoenix audio loop tests and test results

The results presented in the table apply when no accessory is connected and battery voltage is set to 3.7V.

Earpiece, internal microphone and speaker are in place during measurement. Applying a headset accessory during measurement causes a significant drop in measured quantities.

The gain values presented in the table apply for a differential output vs. single-ended/differential input.

Loop test	Input terminal	Output terminal	Path gain [dB] (fixed)	Input voltage [mVp-p]	Differential output voltage [mVp-p]	Output DC level [V]	Output current [mA]
External Mic to External Earpiece	XMICP and GND	HSEAR R P, HSEAR R N and GND	-2.9	1000	720	1.2	NA
		HSEAR P, HSEAR N and GND					
	XMICN and GND	HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					
External Mic to Internal Earpiece	XMICP and GND	EarP and GND	-4.5	1000	600	1.2	NA
		EarN and GND					
	XMICN and GND	EarP and GND					
		EarN and GND					
External Mic to Internal handsfree	XMICP and GND	B2102 pads	-5	1000	560	0	25mA (calc.)
	XMICN and GND	B2102 pads					
Internal Mic to External Earpiece	B2100 (OUT/GND)	HSEAR R P, HSEAR R N and GND	22.7	100	1360	1.2	NA
		HSEAR P, HSEAR N and GND					
		HSEAR R P, HSEAR R N and GND					
		HSEAR P, HSEAR N and GND					

Measurement data

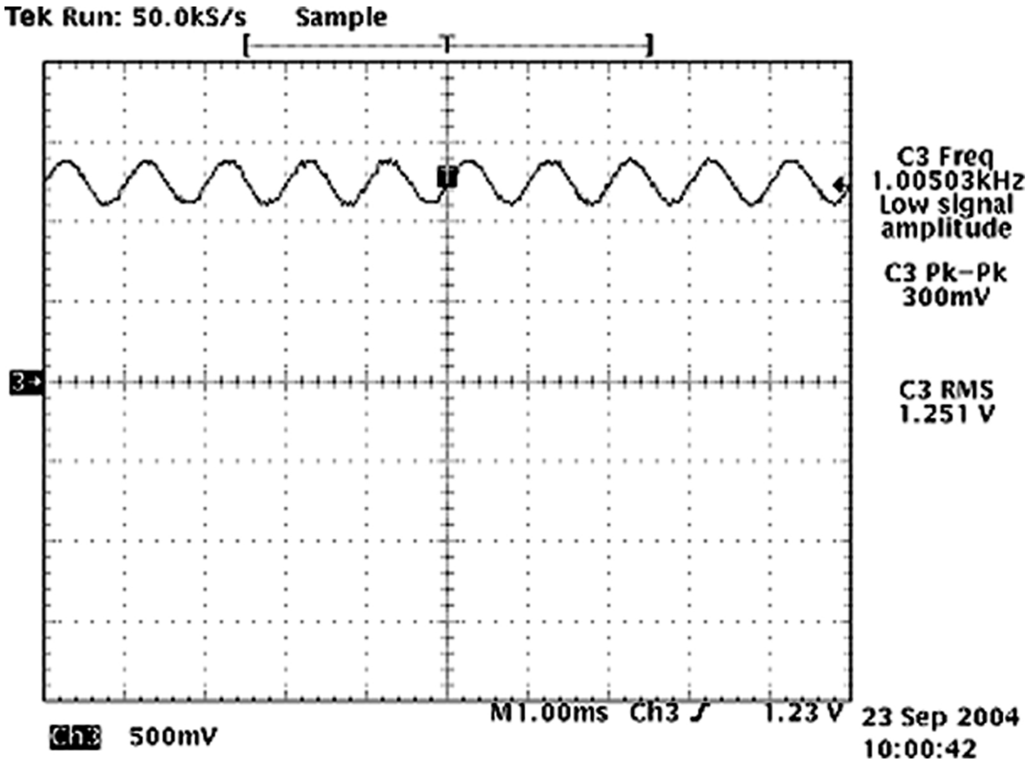
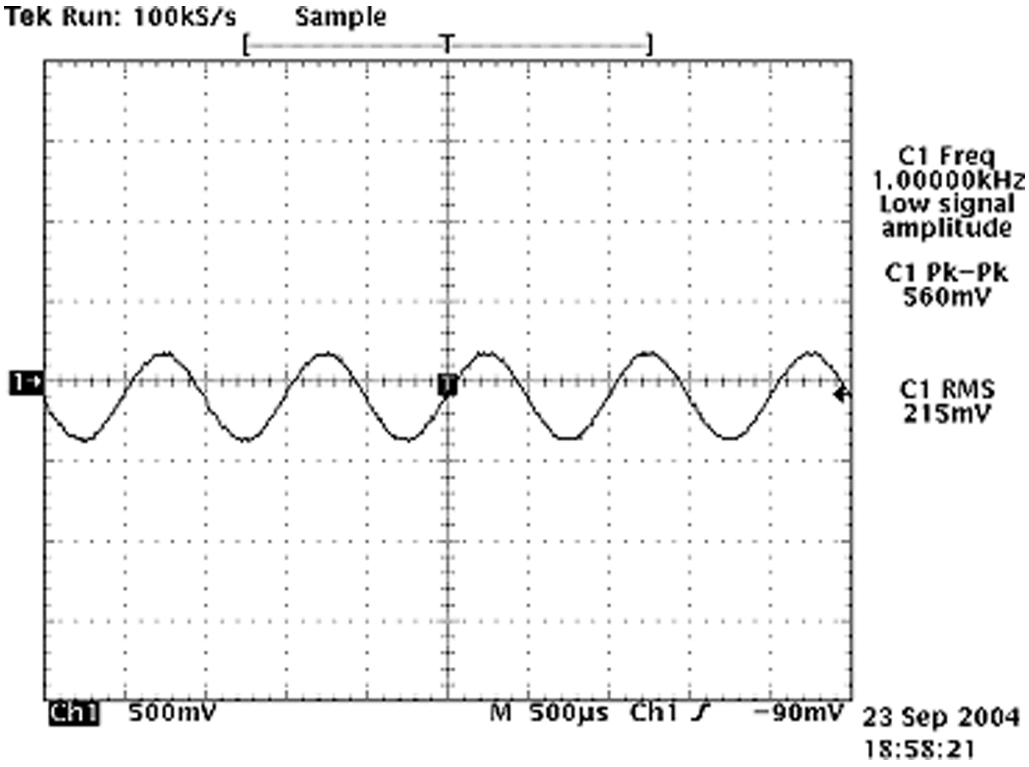


Figure 13 Single-ended output waveform of the Ext_in_HP_out measurement when earpiece is connected.



If a special low-pass filter designed for measuring digital amplifiers is unavailable, the measurement must be performed with a current probe and the input signal frequency must be 2kHz.

Figure 14 Differential output waveform of the Ext_in_IHF_out out loop measurement when speaker is connected.

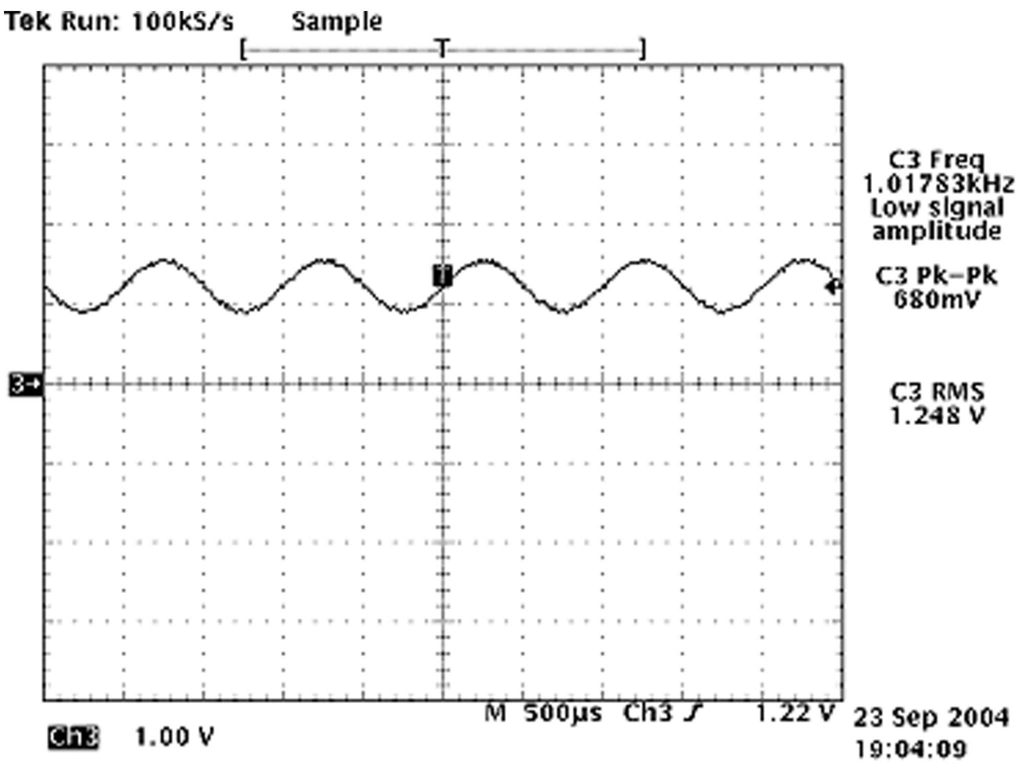
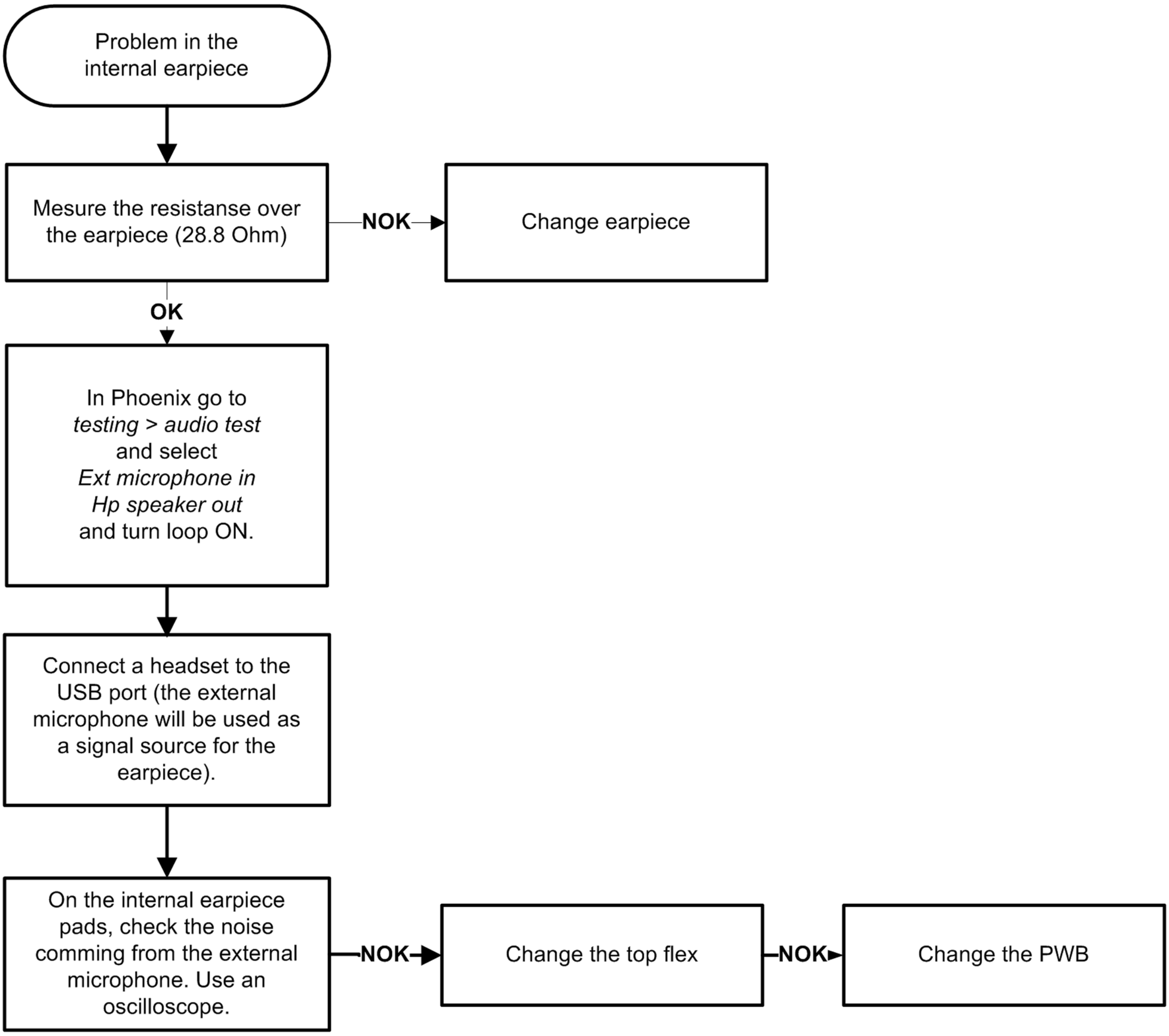


Figure 15 Single-ended output waveform of the HP_in_Ext_out loop when microphone is connected.

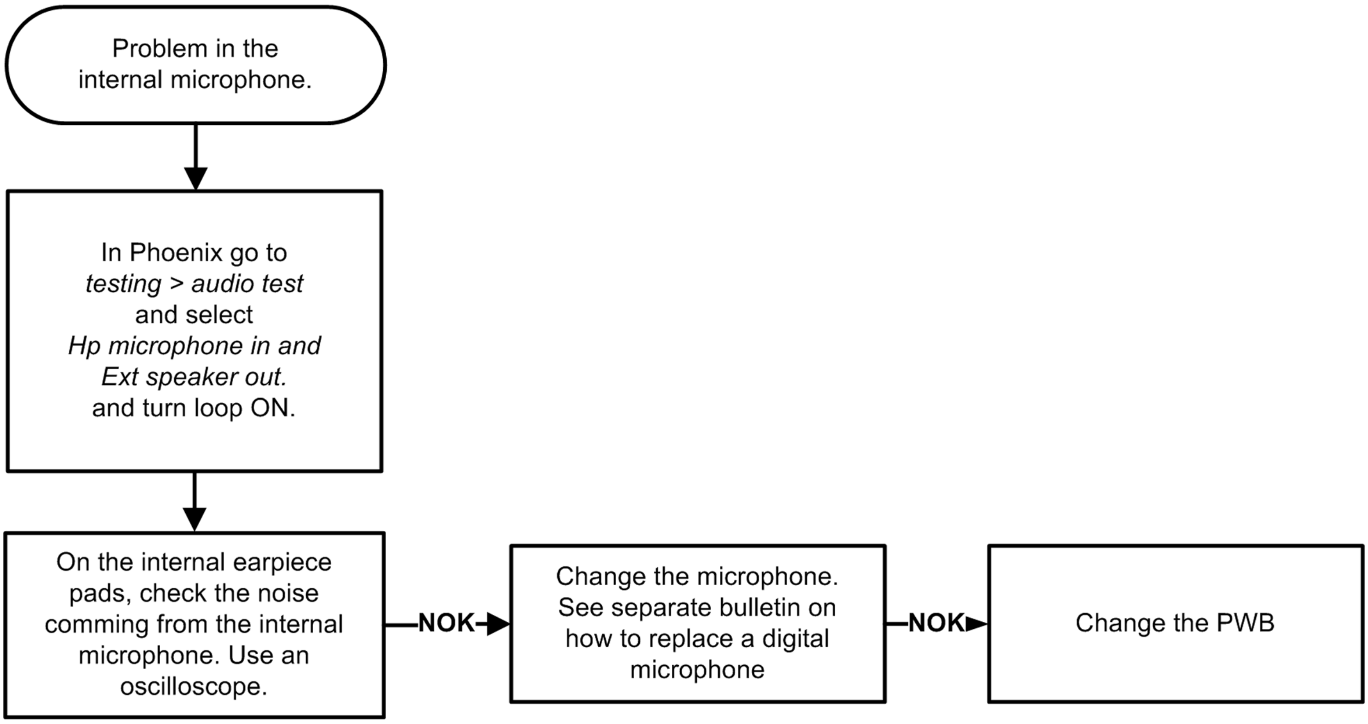
Internal earpiece troubleshooting

Troubleshooting flow


Problem in the internal earpiece
Mesure the resistanse over the earpiece (28.8 Ohm)
NOK
Change earpiece
OK
In Phoenix go to *testing > audio test* and select *Ext microphone in Hp speaker out* and turn loop ON.
Connect a headset to the USB port (the external microphone will be used as a signal source for the earpiece).
On the internal earpiece pads, check the noise comming from the external microphone. Use an oscilloscope.
NOK
Change the top flex
NOK
Change the PWB

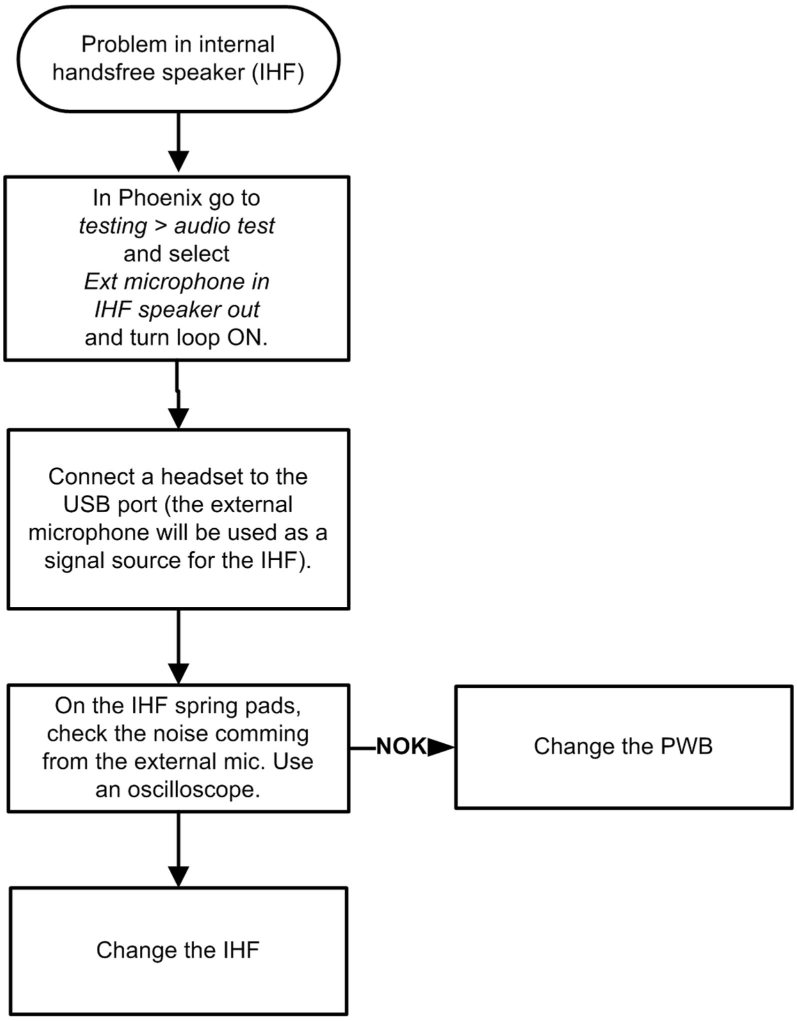
Internal microphone troubleshooting

Troubleshooting flow


Problem in the internal microphone.
In Phoenix go to *testing > audio test* and select *Hp microphone in and Ext speaker out.* and turn loop ON.
On the internal earpiece pads, check the noise comming from the internal microphone. Use an oscilloscope.
NOK
Change the microphone. See separate bulletin on how to replace a digital microphone
NOK
Change the PWB

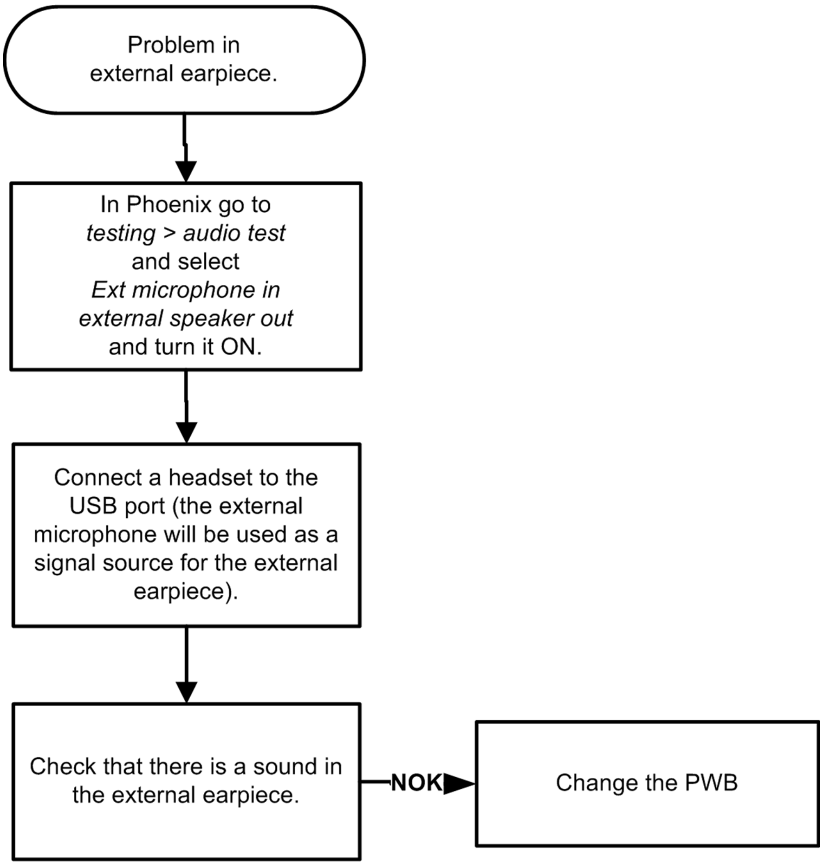
Internal handsfree (IHF) troubleshooting

Troubleshooting flow


Problem in internal handsfree speaker (IHF)
In Phoenix go to *testing > audio test* and select *Ext microphone in IHF speaker out* and turn loop ON.
Connect a headset to the USB port (the external microphone will be used as a signal source for the IHF).
On the IHF spring pads, check the noise comming from the external mic. Use an oscilloscope.
NOK
Change the PWB
Change the IHF

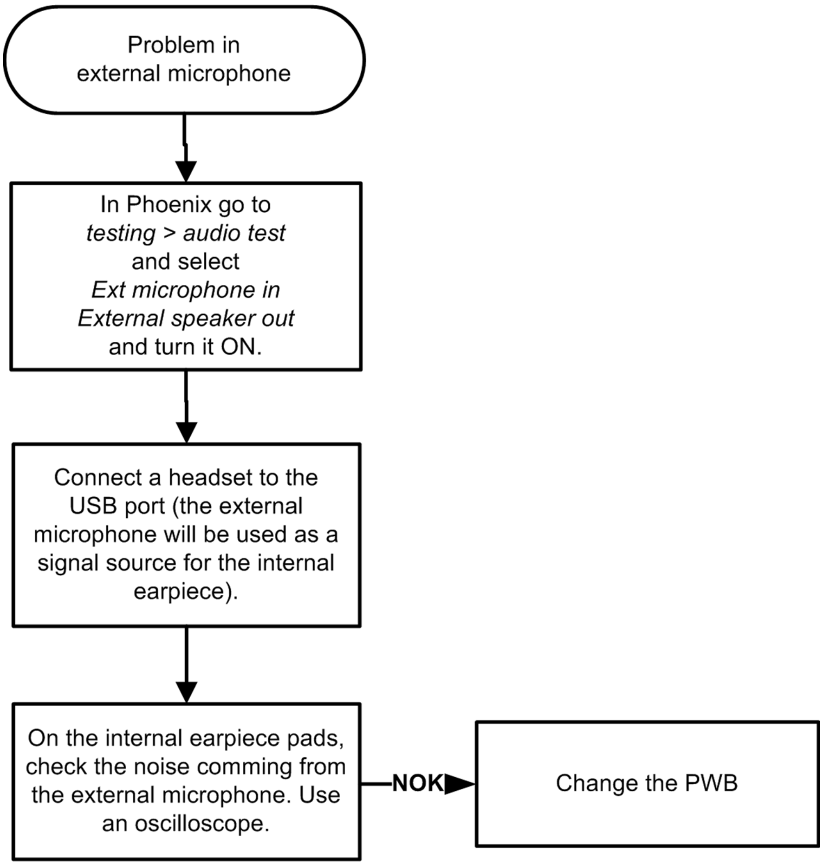
External earpiece troubleshooting

Troubleshooting flow


Problem in external earpiece.
In Phoenix go to *testing > audio test* and select *Ext microphone in external speaker out* and turn it ON.
Connect a headset to the USB port (the external microphone will be used as a signal source for the external earpiece).
Check that there is a sound in the external earpiece.
NOK
Change the PWB

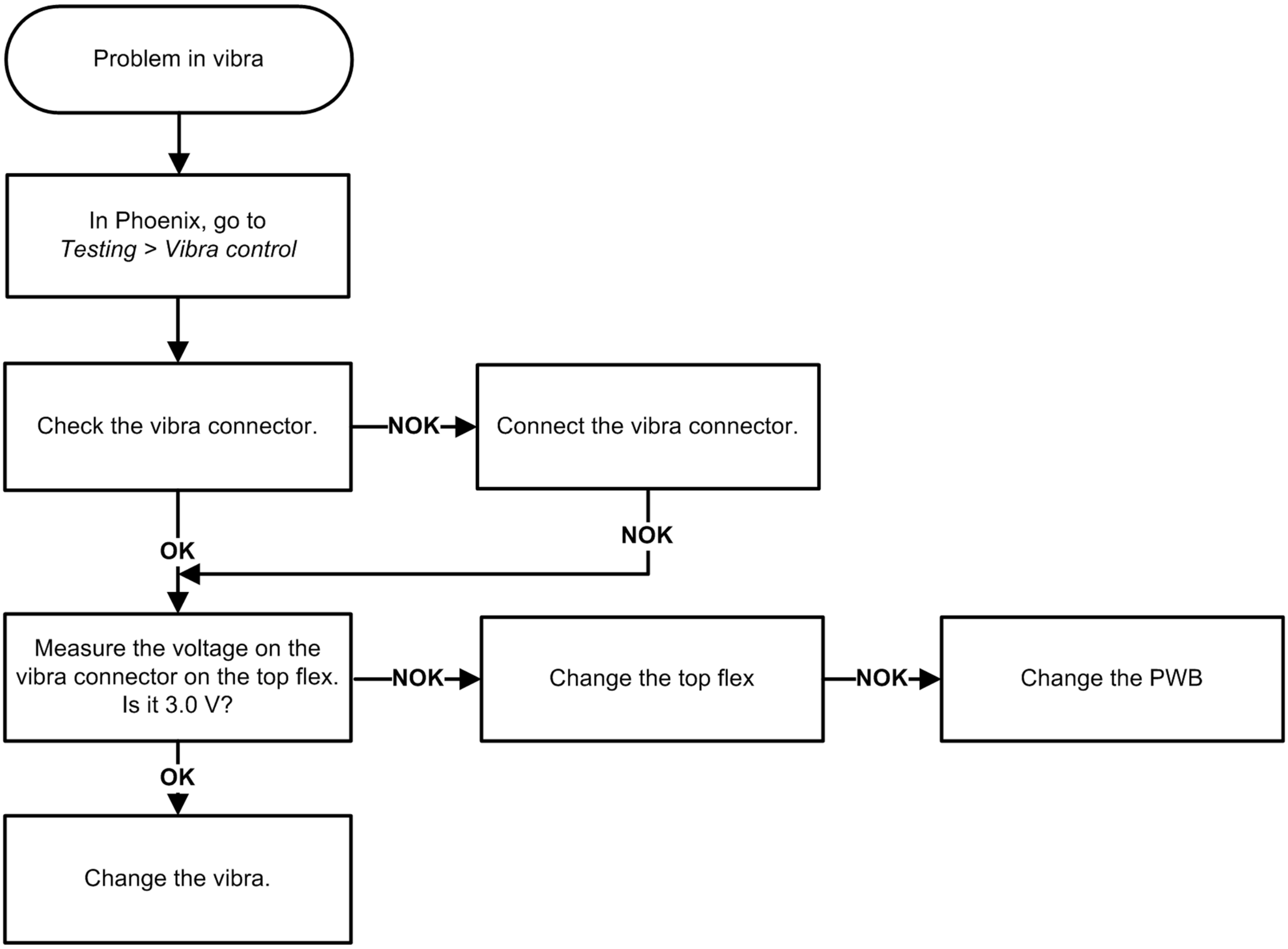
External microphone troubleshooting

Troubleshooting flow


Problem in external microphone
In Phoenix go to *testing > audio test* and select *Ext microphone in External speaker out* and turn it ON.
Connect a headset to the USB port (the external microphone will be used as a signal source for the internal earpiece).
On the internal earpiece pads, check the noise comming from the external microphone. Use an oscilloscope.
NOK
Change the PWB

Vibra troubleshooting

Troubleshooting flow


Problem in vibra
In Phoenix, go to *Testing > Vibra control*
Check the vibra connector.
NOK
Connect the vibra connector.
NOK
OK
Measure the voltage on the vibra connector on the top flex. Is it 3.0 V?
NOK
Change the top flex
NOK
Change the PWB
OK
Change the vibra.

Bluetooth troubleshooting

Troubleshooting flow

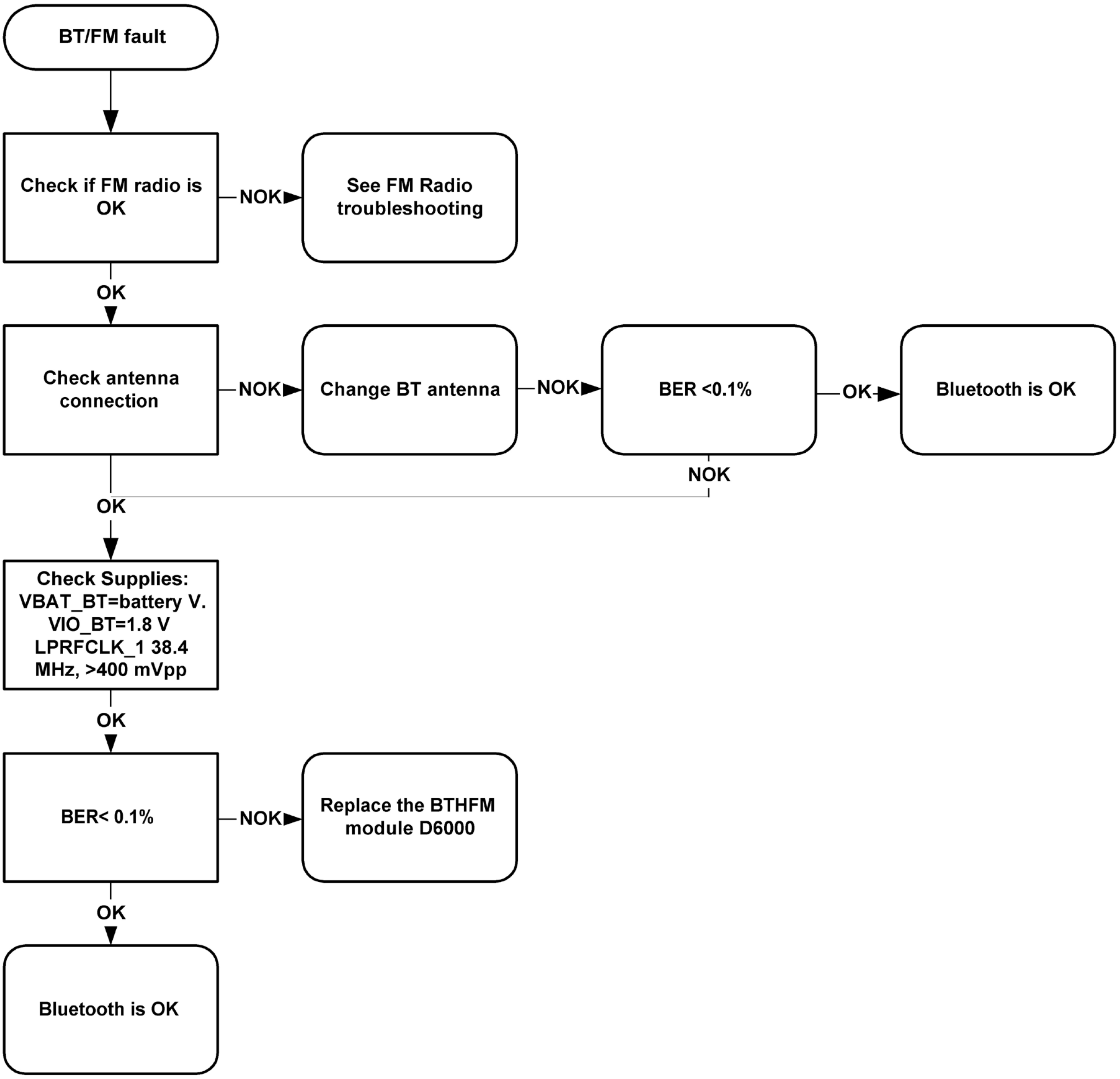

BT/FM fault
Check if FM radio is OK
NOK
See FM Radio troubleshooting
OK
Check antenna connection
NOK
Change BT antenna
NOK
BER <0.1%
OK
Bluetooth is OK
NOK
OK
Check Supplies:
VBAT_BT=battery V.
VIO_BT=1.8 V
LPRFCLK_1 38.4 MHz, >400 mVpp
OK
BER< 0.1%
NOK
Replace the BTHFM module D6000
OK
Bluetooth is OK

Figure 16 Troubleshooting diagram: Bluetooth

Baseband manual tuning guide

Certificate restoring for BB5 products

Context

This procedure is performed when the device certificate is corrupted for some reason.

All tunings (RF & Baseband, UI) must be done after performing the certificate restoring procedure.

The procedure for certificate restoring is the following:

- Flash the phone with the latest available software using FPS-8 or FPS-10.

  Note: USB flashing does not work for a dead BB5 phone.
- Create a request file.
- Send the file to Nokia by e-mail. Use the following addresses depending on your location:
  - APAC: sydney.service@nokia.com
  - CHINA: repair.ams@nokia.com
  - E&A: salo.repair@nokia.com
  - AMERICAS: fls1.usa@nokia.com
- When you receive a reply from Nokia, carry out certificate restoring.
- Tune the phone completely.

  Note: SX-4 smart card is needed.
- If the phone resets after certificate restoring, reflash the phone again.

Required equipment and setup:

- *Phoenix* service software v 2007.19 or newer.
- The latest phone model specific *Phoenix* data package.
- PKD-1 dongle
- SX-4 smart card (Enables BB5 testing and tuning features)
- External smart card reader

  Note: The smart card reader is only needed when FPS-8 is used. FPS-10 has an integrated smart card reader.
- Activated FPS-8 flash prommer **OR** FPS-10 flash prommer
- Flash update package 03.18.004 or newer for FPS-8 or FPS-10 flash prommers
- CU-4 control unit
- USB cable from PC USB Port to CU-4 control unit
- Phone model specific adapter for CU-4 control unit
- PCS-1 cable to power CU-4 from external power supply
- XCS-4 modular cable between flash prommer and CU-4

  Note: CU-4 must be supplied with +12 V from an external power supply in all steps of certificate restoring.

Steps

1. Program the phone software.

   i Start *Phoenix* and login. Make sure the connection has been managed correctly for FPS-8 or FPS-10.

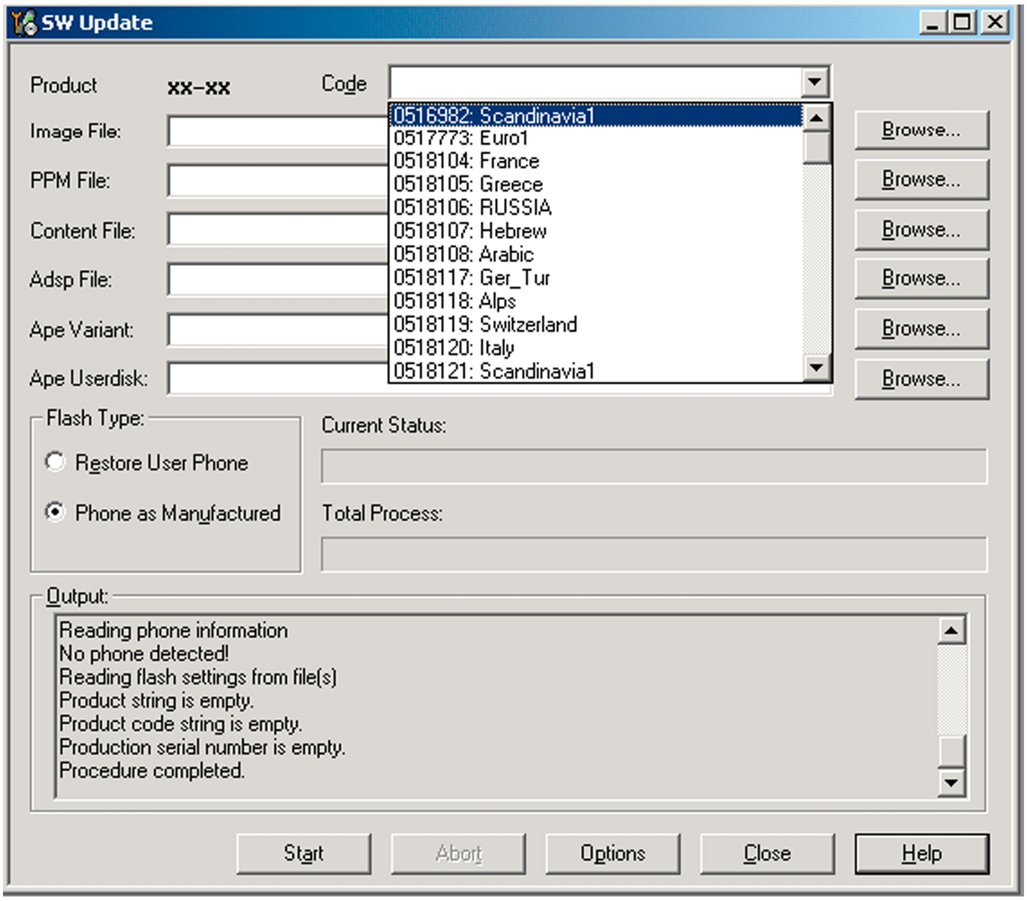
   ii Update the phone MCU software to the latest available version.

   If the new flash is empty and the phone cannot communicate with *Phoenix*, reflash the phone.

   iii Choose the product manually from **File→Open Product** , and click **OK**.

   Wait for the phone type designator (e.g. “RM-1”) to be displayed in the status bar.

   iv Go to **Flashing→SW Update** and wait until *Phoenix* reads the product data as shown in the following picture.



SW Update
Image File:
PPM File:
Content File:
Adsp File:
Ape Variant:
Ape Userdisk:
Browse...
Browse...
Browse...
Browse...
Browse...
Browse...
Current Status:
Total Process:
Start
Abort
Options
Close
Help

Product xx-xx

Code

- 0516982: Scandinavia1
- 0517773: Euro1
- 0518104: France
- 0518105: Greece
- 0518106: RUSSIA
- 0518107: Hebrew
- 0518108: Arabic
- 0518117: Ger_Tur
- 0518118: Alps
- 0518119: Switzerland
- 0518120: Italy
- 0518121: Scandinavia1

Flash Type:

○ Restore User Phone

● Phone as Manufactured

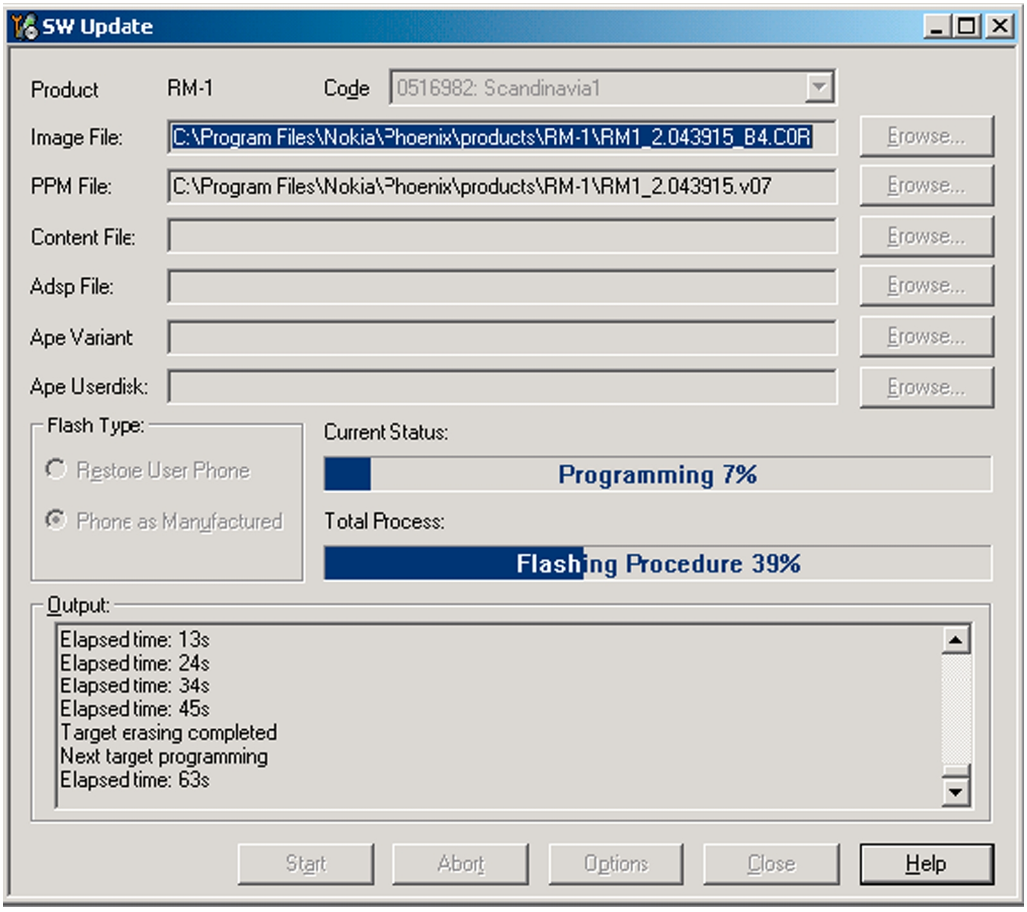
Output:

```
Reading phone information
No phone detected!
Reading flash settings from file(s)
Product string is empty.
Product code string is empty.
Production serial number is empty.
Procedure completed.
```

Product	is automatically set according to the phone support module which was opened manually, but the flash files cannot be found because the correct data cannot be read from the phone automatically.
Code	must be chosen manually, it determines the correct flash files to be used. Please choose the correct product code (can be seen in the phone type label) from the dropdown list.
Flash Type	must be set to **Phone as Manufactured**.

- To continue, click **Start**.

  Progress bars and messages on the screen show actions during phone programming, please wait.


SW Update
Browse...
Browse...
Browse...
Browse...
Browse...
Browse...
Start
Abort
Options
Close
Help

Product: RM-1
Code: 0516982: Scandinavia1
Image File: C:\Program Files\Nokia\Phoenix\products\RM-1\RM1_2.043915_B4.C0R
PPM File: C:\Program Files\Nokia\Phoenix\products\RM-1\RM1_2.043915.v07
Content File:
Adsp File:
Ape Variant
Ape Userdisk:

Flash Type:
○ Restore User Phone
● Phone as Manufactured

Current Status: Programming 7%
Total Process: Flashing Procedure 39%

Output:

```
Elapsed time: 13s
Elapsed time: 24s
Elapsed time: 34s
Elapsed time: 45s
Target erasing completed
Next target programming
Elapsed time: 63s
```

Programming is completed when Flashing Completed message is displayed.

The product type designator and MCU SW version are displayed in the status bar.

vi Close the *SW Update* window and then choose **File→Close Product** .

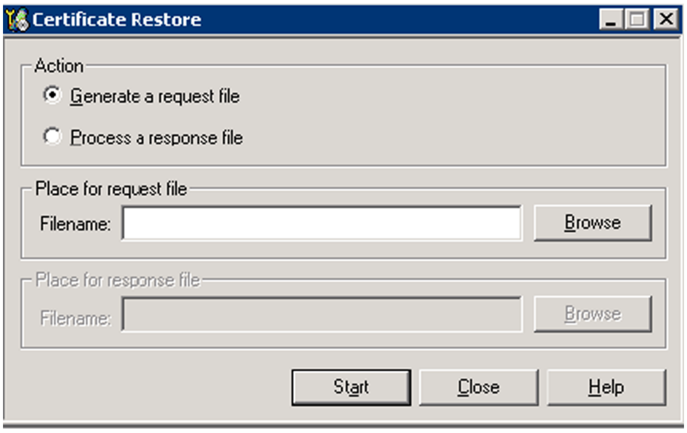
2. Create a *Request* file.

For this procedure, you must supply +12 V to CU-4 from an external power supply.

i To connect the phone with *Phoenix*, choose **File→Scan Product** .

ii Choose **Tools→Certificate Restore** .

iii To choose a location for the request file, click **Browse**.

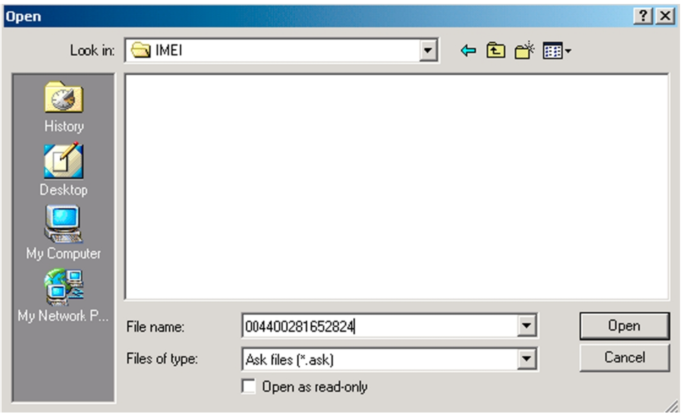

Certificate Restore
Browse
Browse
Start
Close
Help

Action
● Generate a request file
○ Process a response file

Place for request file
Filename:

Place for response file
Filename:

iv Name the file so that you can easily identify it, and click **Open**.



Open

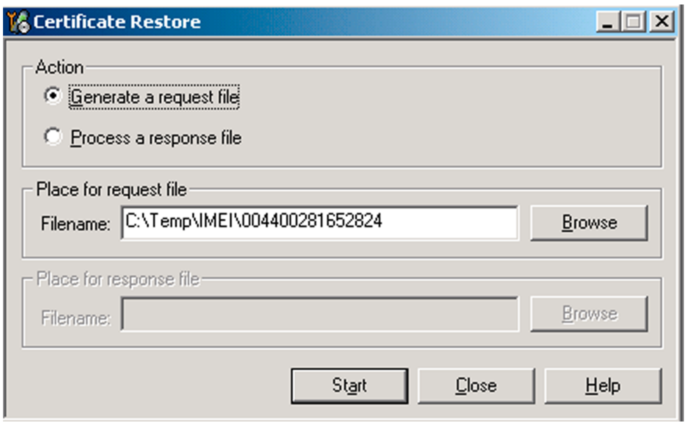
Look in: IMEI

File name: 004400281652824

Files of type: Ask files (*.ask)

☐ Open as read-only

The name of the file and its location are shown.



Certificate Restore

Action

● Generate a request file

○ Process a response file

Place for request file

Filename: C:\Temp\IMEI\004400281652824

Place for response file

Filename:

v To create the *Request* file, click **Start**.

vi When the file for certificate restore has been created, send it to Nokia as an e-mail attachment.

3. Restore certificate.

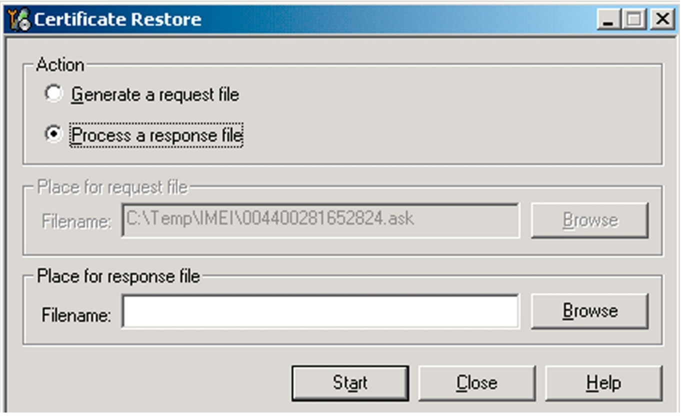
For this procedure, you must supply +12 V to CU-4 from an external power supply.

i Save the reply file sent by Nokia to your computer.

ii Start *Phoenix* service software.

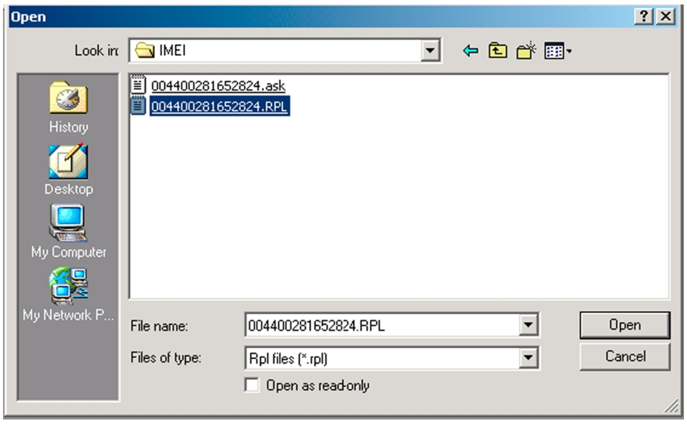
iii Choose **File→Scan Product** .

iv From the **Tools** menu, choose **Certificate Restore** and select **Process a response file** in the *Action* pane.


Certificate Restore
Action
○ Generate a request file
● Process a response file
Place for request file
Filename: C:\Temp\IMEI\004400281652824.ask
Browse
Place for response file
Filename:
Browse
Start
Close
Help

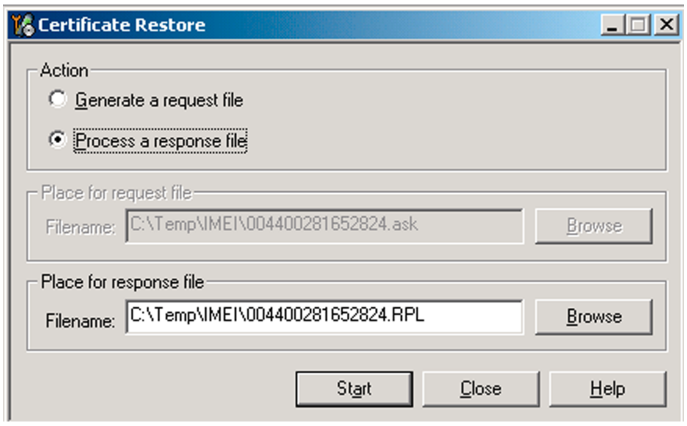
v To choose the location where response file is saved, click **Browse**.

vi Click **Open**.


Open
Look in: IMEI
004400281652824.ask
004400281652824.RPL
History
Desktop
My Computer
My Network P...
File name: 004400281652824.RPL
Files of type: Rpl files (*.rpl)
☐ Open as read-only
Open
Cancel

The name of the file and the path where it is located are shown.

vii To write the file to phone, click **Start**.


Certificate Restore
Action
○ Generate a request file
● Process a response file
Place for request file
Filename: C:\Temp\IMEI\004400281652824.ask
Browse
Place for response file
Filename: C:\Temp\IMEI\004400281652824.RPL
Browse
Start
Close
Help

Next actions

After a successful rewrite, you must retune the phone completely by using *Phoenix* tuning functions.

Important: Perform all tunings: RF, BB, and UI.

Energy management calibration

Prerequisites

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File**→ **Scan Product.**
4. Choose **Tuning**→**Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.

8. Click **Calibrate**.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 10 Calibration value limits

Parameter	Min.	Max.
ADC Offset	-20	20
ADC Gain	12000	14000
BSI Gain	1100	1300
VBAT Offset	2400	2650
VBAT Gain	19000	23000
VCHAR Gain	N/A	N/A
IBAT (ICal) Gain	7750	12250

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.

4 — RF troubleshooting

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General RF troubleshooting

Introduction to RF troubleshooting

Most RF semiconductors are static discharge sensitive

ESD protection must be applied during repair (ground straps and ESD soldering irons).

Pre-baking

These parts are moisture sensitive and must be pre-baked prior to soldering:

- RFIC N7505
- Front End Module (FEM) N7520
- WCDMA PA N7540

Discrete components

In addition to the key-components, there are a number of discrete components (resistors, inductors and capacitors) for which troubleshooting is done mainly by *visual inspection*.

Capacitors: check for short circuits.

Resistors: check value with an ohm meter.

> **Note:** In-circuit measurements should be evaluated carefully

Measuring equipment

All measurements should be done using:

- An oscilloscope for low frequency and DC measurements. Recommended probe: 10:1, 10Mohm//8pF.
- A radio communication tester including RF generator and spectrum analyser, for example Rohde & Schwarz CMU200. (Alternatively a spectrum analyser and an RF generator can be used. Some tests in this guide are not possible to perform if this solution is chosen).

> **Note:** A mobile phone WCDMA transmitter should never be tested with full TX power (only it possible to perform the measurements in a good RF-shielded room). Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.
>
> **Note:** All measurements with an RF coupler should be performed in an RF-shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, testing at frequencies of nearby base stations should be avoided.

Level of repair

The scope of this guideline is to enable repairs at key-component level. Some key-components are not accessible without replacing the whole shield frame (i.e. not replaceable). Please refer to section *Non-replaceable RF components*.

RF key components

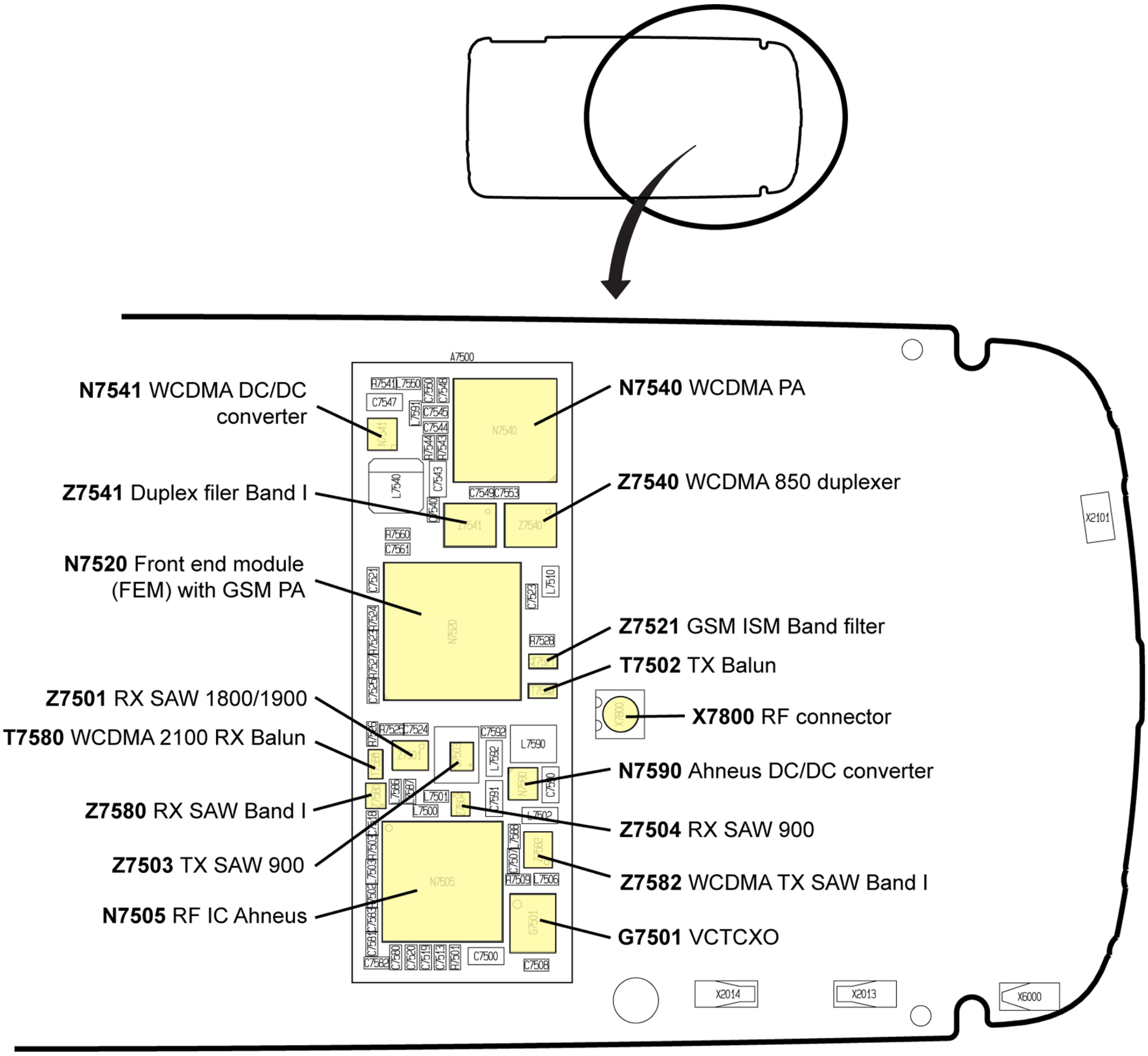

N7541 WCDMA DC/DC converter
Z7541 Duplex filer Band I
N7520 Front end module (FEM) with GSM PA
Z7501 RX SAW 1800/1900
T7580 WCDMA 2100 RX Balun
Z7580 RX SAW Band I
Z7503 TX SAW 900
N7505 RF IC Ahneus
N7540 WCDMA PA
Z7540 WCDMA 850 duplexer
Z7521 GSM ISM Band filter
T7502 TX Balun
X7800 RF connector
N7590 Ahneus DC/DC converter
Z7504 RX SAW 900
Z7582 WCDMA TX SAW Band I
G7501 VCTCXO
A7500
X2101
X2014
X2013
X6000

Figure 17 RF key components

Non-replaceable RF components

Because of their location on the PWB, the following RF components cannot be replaced without replacing the whole shield frame:

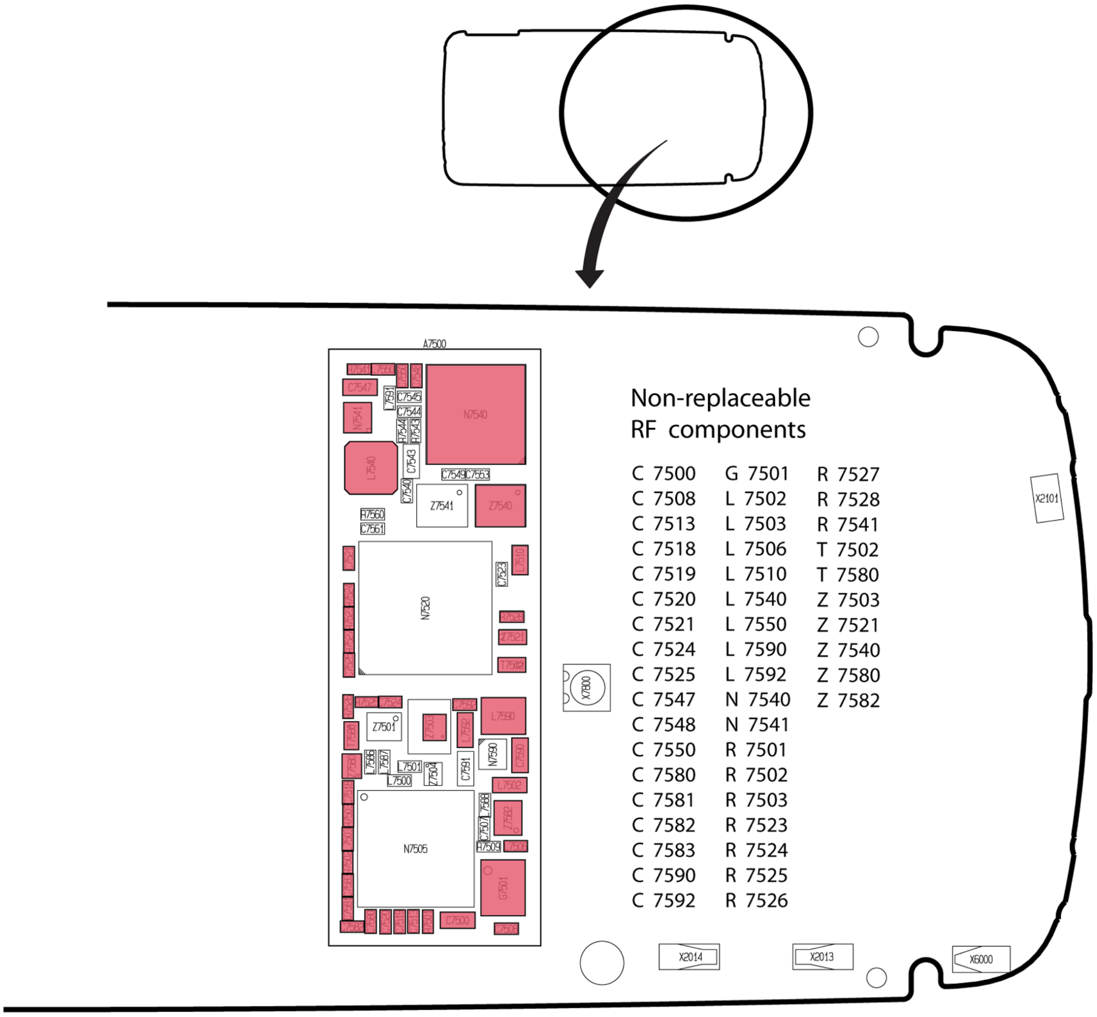

A7500
N7540
N7520
N7505
Z7541
Z7501
X7800
X2101
X2014
X2013
X6000
Non-replaceable
RF components
C 7500
C 7508
C 7513
C 7518
C 7519
C 7520
C 7521
C 7524
C 7525
C 7547
C 7548
C 7550
C 7580
C 7581
C 7582
C 7583
C 7590
C 7592
G 7501
L 7502
L 7503
L 7506
L 7510
L 7540
L 7550
L 7590
L 7592
N 7540
N 7541
R 7501
R 7502
R 7503
R 7523
R 7524
R 7525
R 7526
R 7527
R 7528
R 7541
T 7502
T 7580
Z 7503
Z 7521
Z 7540
Z 7580
Z 7582

Figure 18 Non-replaceable RF components

General voltage checking

Steps

1. Set up the main board in the module jig. The phone should be in local mode.
2. Check the following:

#	Signal name	Test point	Voltage (all bands)
1	VCTCXO supply	R7501	2.5 V
2	AHNEUS supply from DC/DC conv	C7590	3.2 V
3	FEM supply	L7510	3.9 V
4	WCDMA PA supply from DC/DC conv	C7543	0 V (1.3 V* when transmitting. Settings as in note below)
5	Vbat at WCDMA PA	C7547	3.9 V
6	Supply input to DC/DC conv	L7592	3.9 V

* With these settings, the result should be 1.3 V.

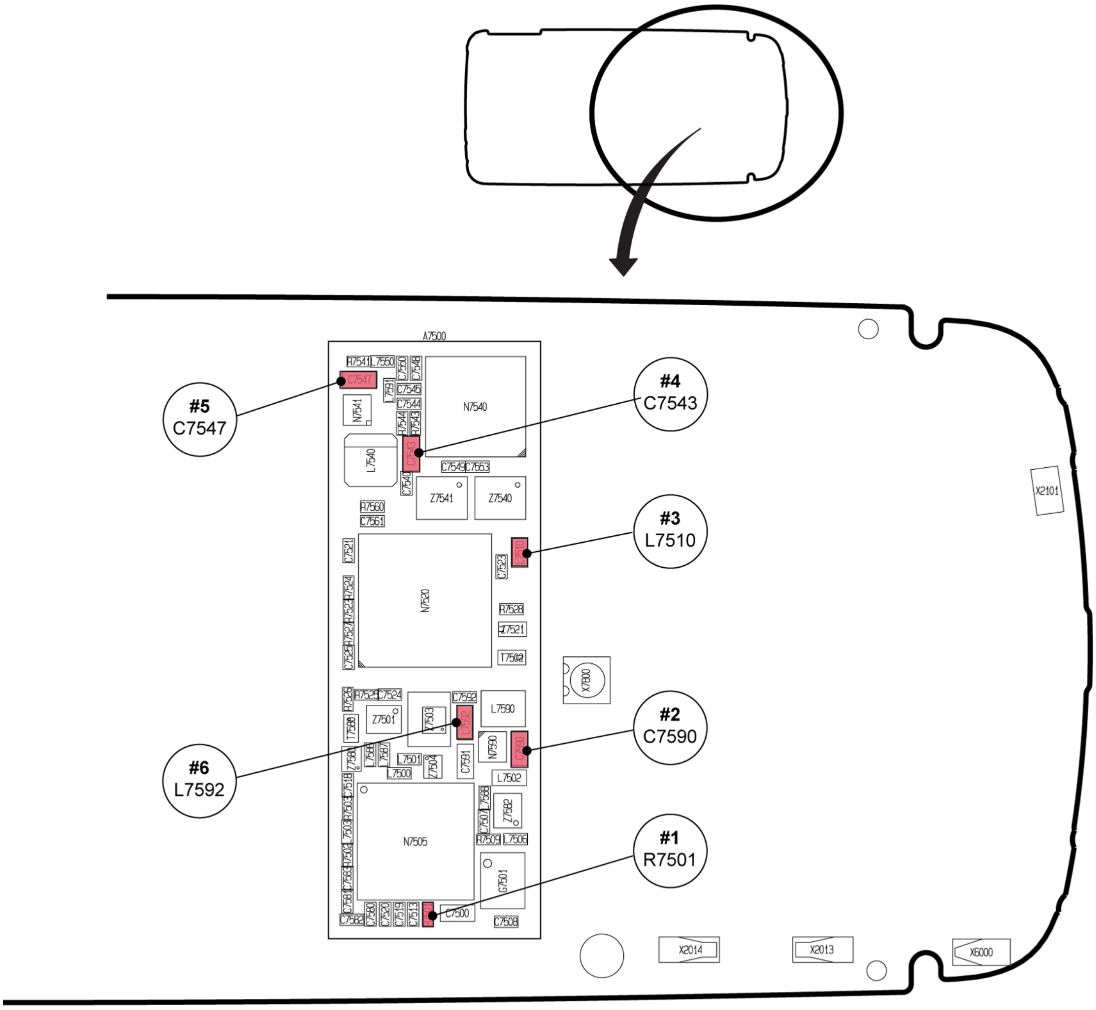

A7500
#5
C7547
#4
C7543
#3
L7510
#2
C7590
#6
L7592
#1
R7501
N7540
N7520
N7505
X2101
X2014
X2013
X6000
X7800

Figure 19 General voltage checking test points

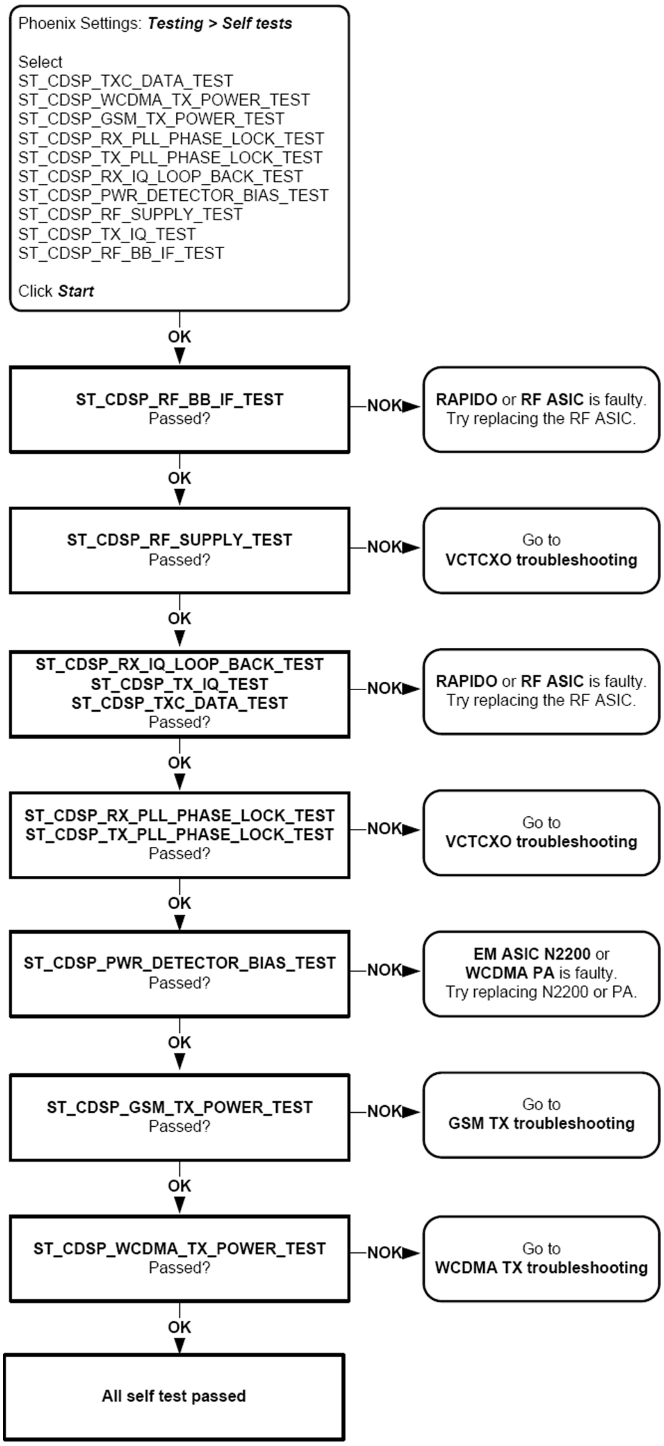
Phoenix self tests

Context

Always start the troubleshooting procedure by running the Phoenix self tests. If a test fails, please follow the diagram below.

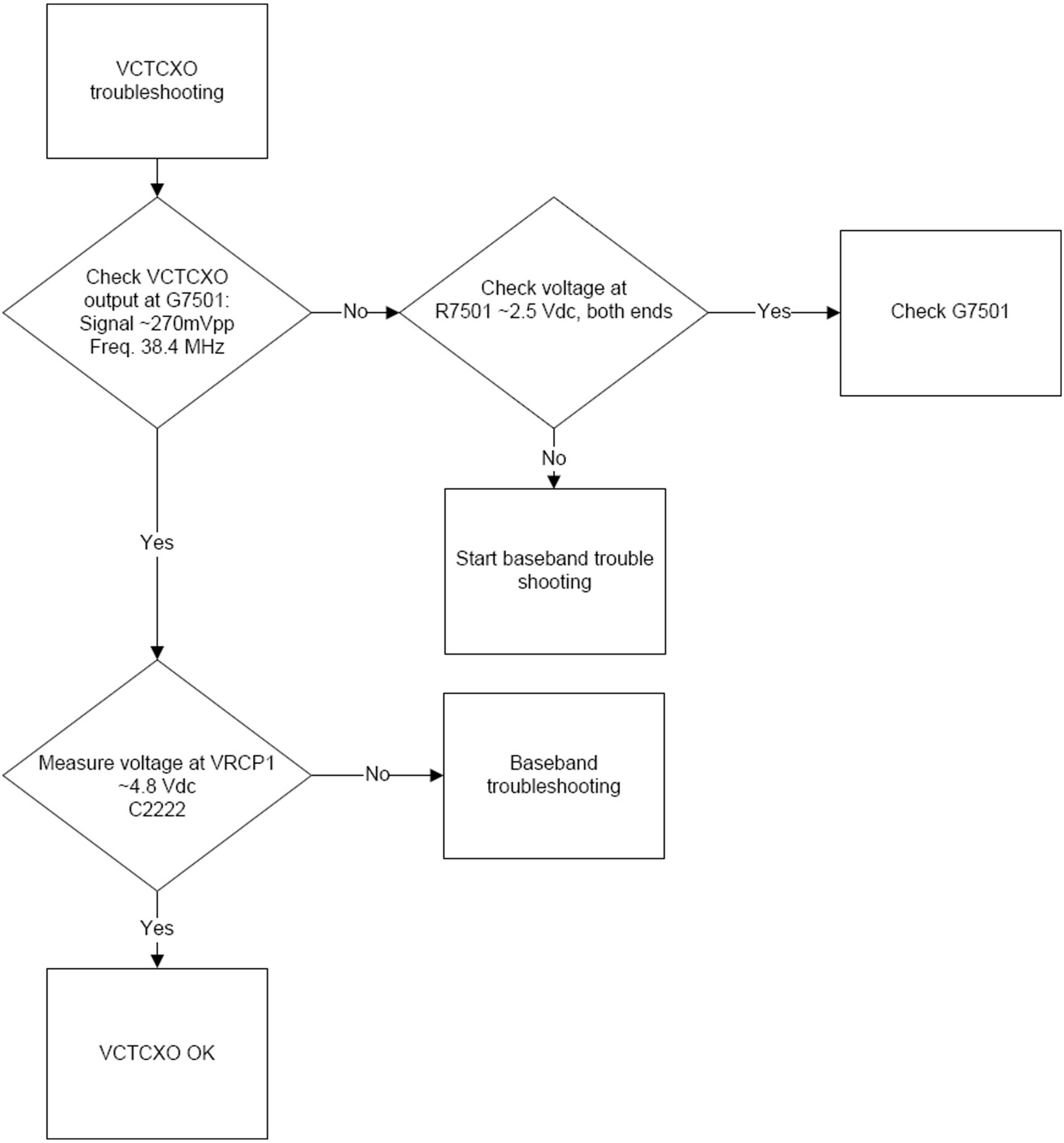
If the phone is dead and you cannot perform the self tests, go to *Dead or jammed device troubleshooting.* in the baseband troubleshooting section.

Troubleshooting flow


Phoenix Settings: *Testing > Self tests*
Select
ST_CDSP_TXC_DATA_TEST
ST_CDSP_WCDMA_TX_POWER_TEST
ST_CDSP_GSM_TX_POWER_TEST
ST_CDSP_RX_PLL_PHASE_LOCK_TEST
ST_CDSP_TX_PLL_PHASE_LOCK_TEST
ST_CDSP_RX_IQ_LOOP_BACK_TEST
ST_CDSP_PWR_DETECTOR_BIAS_TEST
ST_CDSP_RF_SUPPLY_TEST
ST_CDSP_TX_IQ_TEST
ST_CDSP_RF_BB_IF_TEST
Click *Start*
OK
ST_CDSP_RF_BB_IF_TEST Passed?
NOK
RAPIDO or **RF ASIC** is faulty. Try replacing the RF ASIC.
OK
ST_CDSP_RF_SUPPLY_TEST Passed?
NOK
Go to **VCTCXO troubleshooting**
OK
ST_CDSP_RX_IQ_LOOP_BACK_TEST ST_CDSP_TX_IQ_TEST ST_CDSP_TXC_DATA_TEST Passed?
NOK
RAPIDO or **RF ASIC** is faulty. Try replacing the RF ASIC.
OK
ST_CDSP_RX_PLL_PHASE_LOCK_TEST ST_CDSP_TX_PLL_PHASE_LOCK_TEST Passed?
NOK
Go to **VCTCXO troubleshooting**
OK
ST_CDSP_PWR_DETECTOR_BIAS_TEST Passed?
NOK
EM ASIC N2200 or **WCDMA PA** is faulty. Try replacing N2200 or PA.
OK
ST_CDSP_GSM_TX_POWER_TEST Passed?
NOK
Go to **GSM TX troubleshooting**
OK
ST_CDSP_WCDMA_TX_POWER_TEST Passed?
NOK
Go to **WCDMA TX troubleshooting**
OK
All self test passed

VCTCXO troubleshooting

Troubleshooting flow


VCTCXO troubleshooting
Check VCTCXO output at G7501: Signal ~270mVpp Freq. 38.4 MHz
No
Check voltage at R7501 ~2.5 Vdc, both ends
Yes
Check G7501
No
Start baseband trouble shooting
Yes
Measure voltage at VRCP1 ~4.8 Vdc C2222
No
Baseband troubleshooting
Yes
VCTCXO OK

Receiver troubleshooting

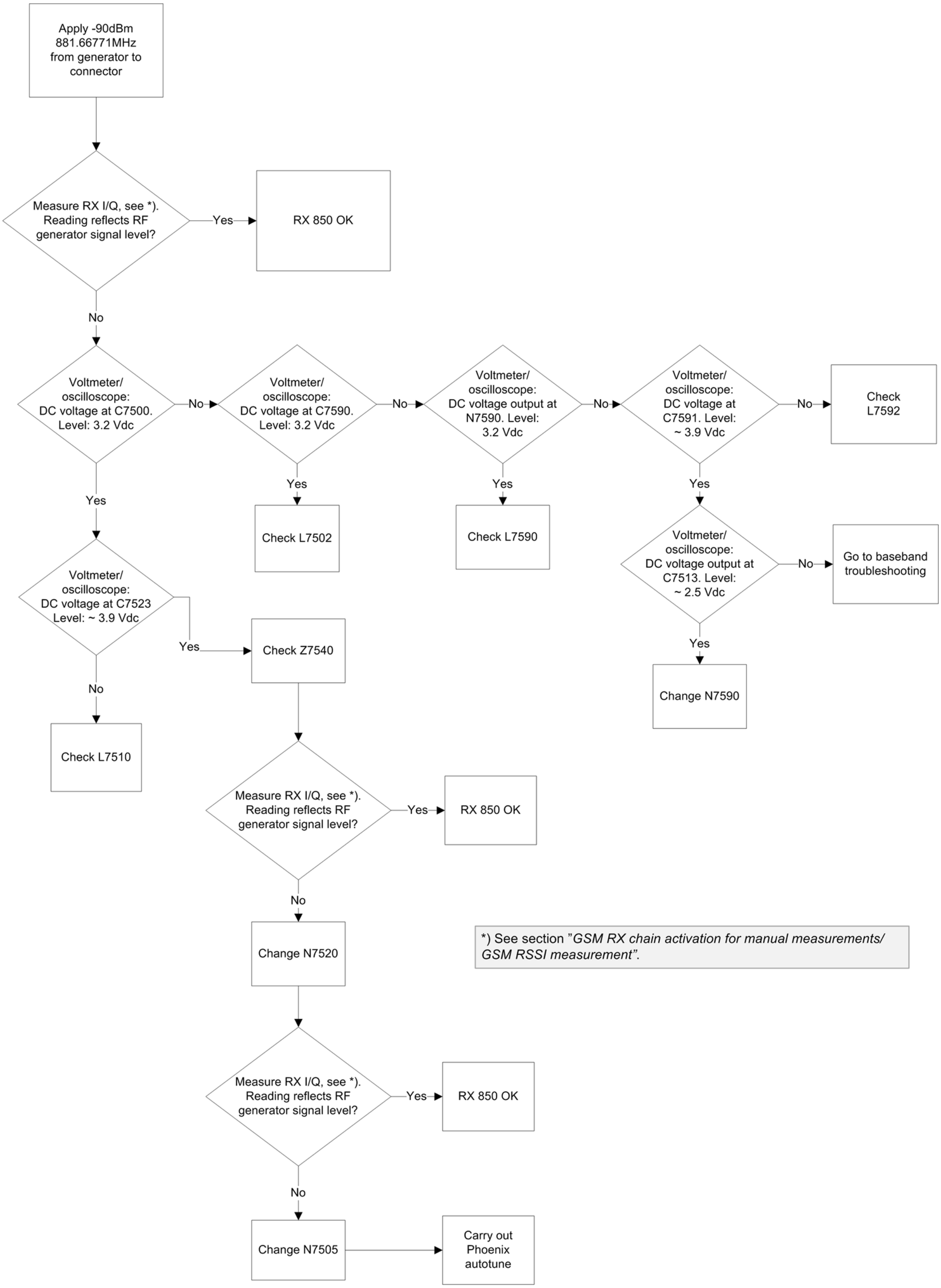
Introduction to receiver (RX) troubleshooting

RX can be tested by making a phone call or in local mode. For the local mode testing, use Phoenix service software.

The main RX troubleshooting measurement is RSSI reading. This test measures the signal strength of the received signal. For GSM RSSI measurements, see section *GSM RX chain activation for manual measurements / GSM RSSI measurement*. For a similar test in WCDMA mode, see section *WCDMA RSSI measurement*.

RX GSM850 troubleshooting

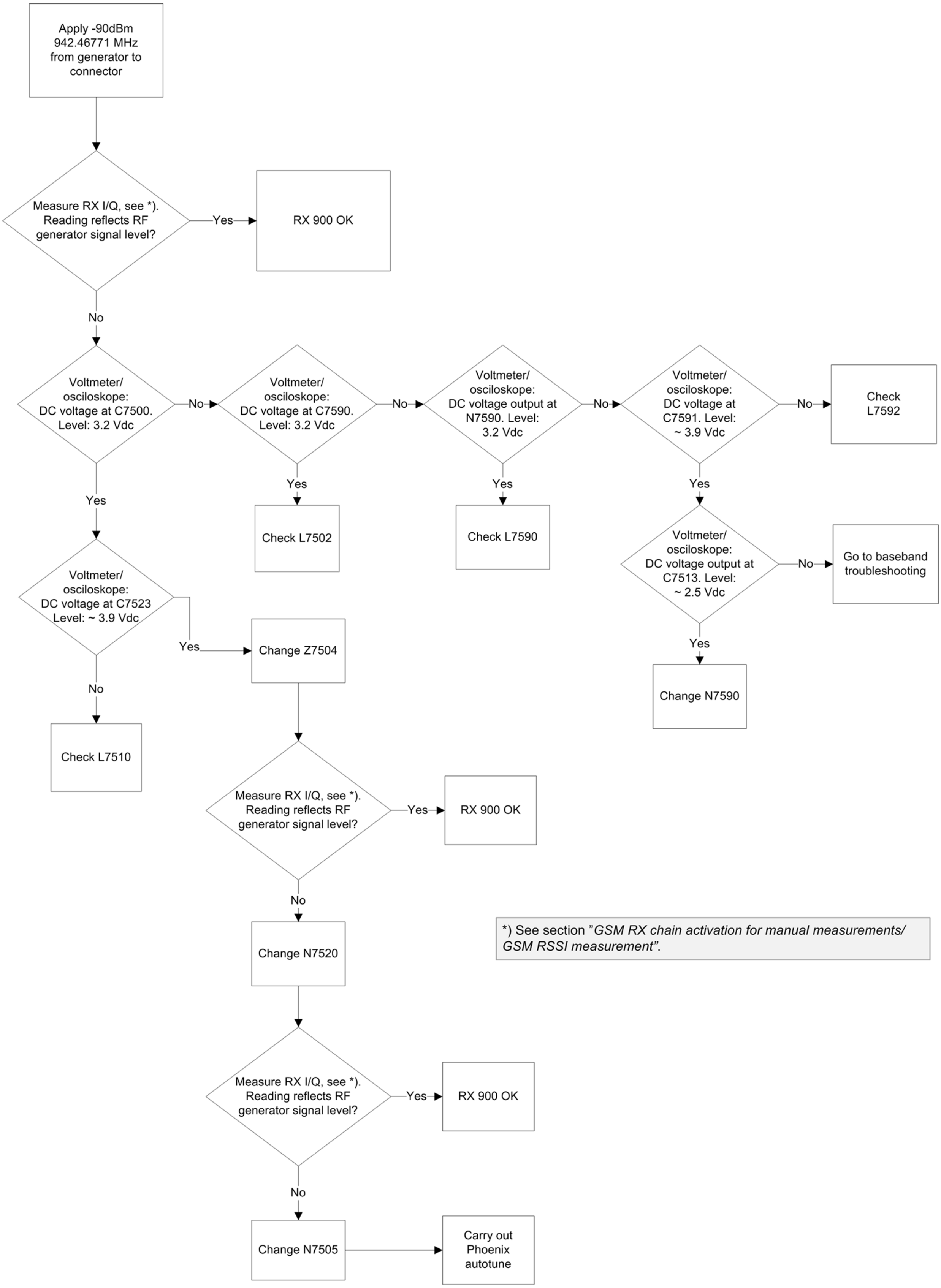
Troubleshooting flow


Apply -90dBm 881.66771MHz from generator to connector
Measure RX I/Q, see *). Reading reflects RF generator signal level?
Yes
RX 850 OK
No
Voltmeter/ oscilloscope: DC voltage at C7500. Level: 3.2 Vdc
No
Voltmeter/ oscilloscope: DC voltage at C7590. Level: 3.2 Vdc
No
Voltmeter/ oscilloscope: DC voltage output at N7590. Level: 3.2 Vdc
No
Voltmeter/ oscilloscope: DC voltage at C7591. Level: ~ 3.9 Vdc
No
Check L7592
Yes
Check L7502
Yes
Check L7590
Yes
Voltmeter/ oscilloscope: DC voltage output at C7513. Level: ~ 2.5 Vdc
No
Go to baseband troubleshooting
Yes
Change N7590
Yes
Voltmeter/ oscilloscope: DC voltage at C7523 Level: ~ 3.9 Vdc
Yes
Check Z7540
No
Check L7510
Measure RX I/Q, see *). Reading reflects RF generator signal level?
Yes
RX 850 OK
No
Change N7520
Measure RX I/Q, see *). Reading reflects RF generator signal level?
Yes
RX 850 OK
No
Change N7505
Carry out Phoenix autotune

*) See section *"GSM RX chain activation for manual measurements/ GSM RSSI measurement"*.

RX GSM900 troubleshooting

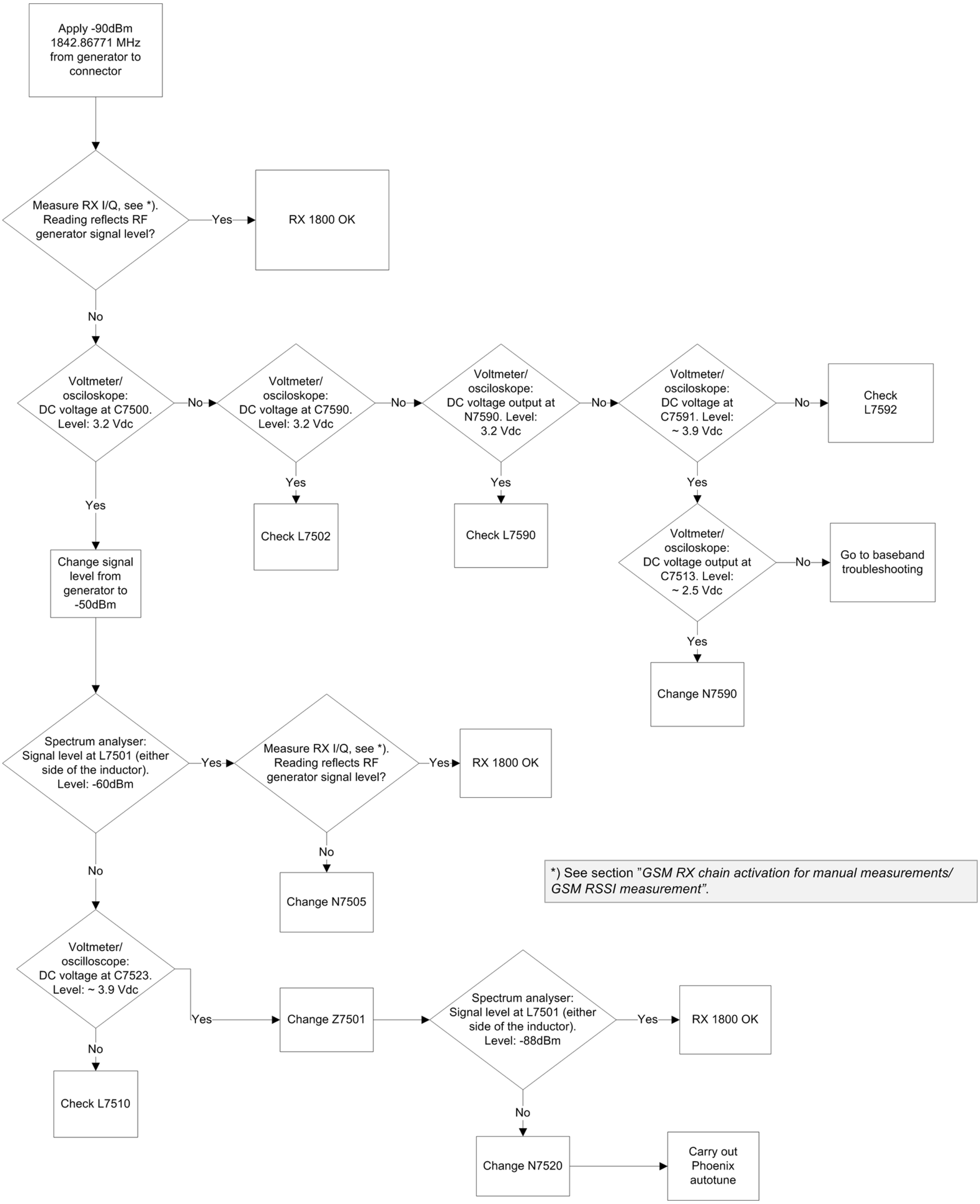
Troubleshooting flow


Apply -90dBm 942.46771 MHz from generator to connector
Measure RX I/Q, see *). Reading reflects RF generator signal level?
Yes
RX 900 OK
No
Voltmeter/ osciloskope: DC voltage at C7500. Level: 3.2 Vdc
No
Voltmeter/ osciloskope: DC voltage at C7590. Level: 3.2 Vdc
No
Voltmeter/ osciloskope: DC voltage output at N7590. Level: 3.2 Vdc
No
Voltmeter/ osciloskope: DC voltage at C7591. Level: ~ 3.9 Vdc
No
Check L7592
Yes
Check L7502
Yes
Check L7590
Yes
Voltmeter/ osciloskope: DC voltage output at C7513. Level: ~ 2.5 Vdc
No
Go to baseband troubleshooting
Yes
Change N7590
Yes
Voltmeter/ osciloskope: DC voltage at C7523 Level: ~ 3.9 Vdc
Yes
Change Z7504
No
Check L7510
Measure RX I/Q, see *). Reading reflects RF generator signal level?
Yes
RX 900 OK
No
Change N7520
Measure RX I/Q, see *). Reading reflects RF generator signal level?
Yes
RX 900 OK
No
Change N7505
Carry out Phoenix autotune

*) See section "*GSM RX chain activation for manual measurements/ GSM RSSI measurement*".

RX GSM1800 troubleshooting

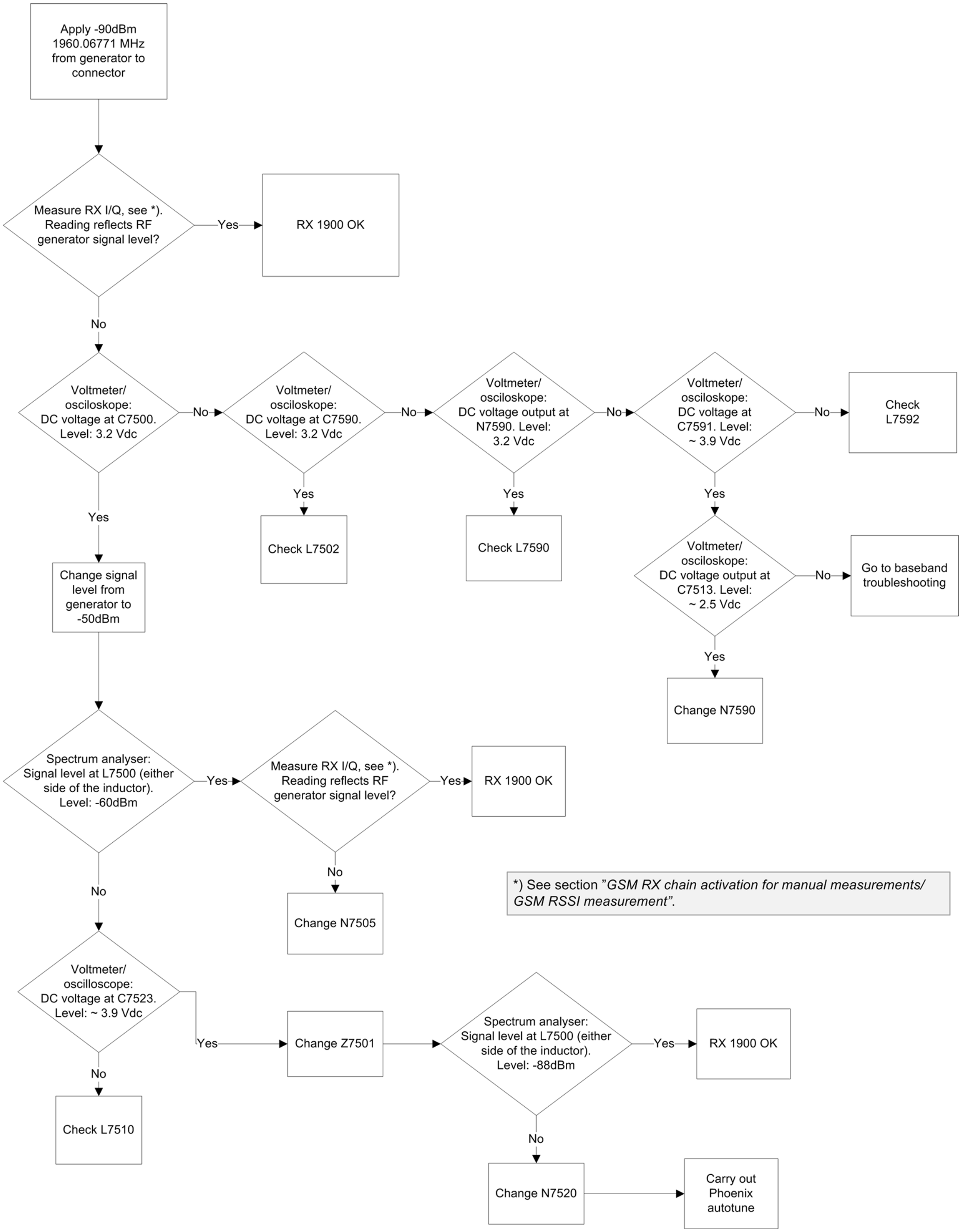
Troubleshooting flow


Apply -90dBm 1842.86771 MHz from generator to connector
Measure RX I/Q, see *). Reading reflects RF generator signal level?
Yes
RX 1800 OK
No
Voltmeter/ osciloskope: DC voltage at C7500. Level: 3.2 Vdc
No
Voltmeter/ osciloskope: DC voltage at C7590. Level: 3.2 Vdc
No
Voltmeter/ osciloskope: DC voltage output at N7590. Level: 3.2 Vdc
No
Voltmeter/ osciloskope: DC voltage at C7591. Level: ~ 3.9 Vdc
No
Check L7592
Yes
Check L7502
Yes
Check L7590
Yes
Voltmeter/ osciloskope: DC voltage output at C7513. Level: ~ 2.5 Vdc
No
Go to baseband troubleshooting
Yes
Change N7590
Yes
Change signal level from generator to -50dBm
Spectrum analyser: Signal level at L7501 (either side of the inductor). Level: -60dBm
Yes
Measure RX I/Q, see *). Reading reflects RF generator signal level?
Yes
RX 1800 OK
No
Change N7505
No
Voltmeter/ oscilloscope: DC voltage at C7523. Level: ~ 3.9 Vdc
Yes
Change Z7501
Spectrum analyser: Signal level at L7501 (either side of the inductor). Level: -88dBm
Yes
RX 1800 OK
No
Check L7510
No
Change N7520
Carry out Phoenix autotune

*) See section "*GSM RX chain activation for manual measurements/ GSM RSSI measurement*".

RX GSM1900 troubleshooting

Troubleshooting flow


Apply -90dBm 1960.06771 MHz from generator to connector
Measure RX I/Q, see *). Reading reflects RF generator signal level?
Yes
RX 1900 OK
No
Voltmeter/ osciloskope: DC voltage at C7500. Level: 3.2 Vdc
No
Voltmeter/ osciloskope: DC voltage at C7590. Level: 3.2 Vdc
No
Voltmeter/ osciloskope: DC voltage output at N7590. Level: 3.2 Vdc
No
Voltmeter/ osciloskope: DC voltage at C7591. Level: ~ 3.9 Vdc
No
Check L7592
Yes
Check L7502
Yes
Check L7590
Yes
Voltmeter/ osciloskope: DC voltage output at C7513. Level: ~ 2.5 Vdc
No
Go to baseband troubleshooting
Yes
Change N7590
Yes
Change signal level from generator to -50dBm
Spectrum analyser: Signal level at L7500 (either side of the inductor). Level: -60dBm
Yes
Measure RX I/Q, see *). Reading reflects RF generator signal level?
Yes
RX 1900 OK
No
Change N7505
No
Voltmeter/ oscilloscope: DC voltage at C7523. Level: ~ 3.9 Vdc
Yes
Change Z7501
Spectrum analyser: Signal level at L7500 (either side of the inductor). Level: -88dBm
Yes
RX 1900 OK
No
Change N7520
Carry out Phoenix autotune
No
Check L7510

*) See section "*GSM RX chain activation for manual measurements/ GSM RSSI measurement*".

GSM RX chain activation for manual measurements/GSM RSSI measurement

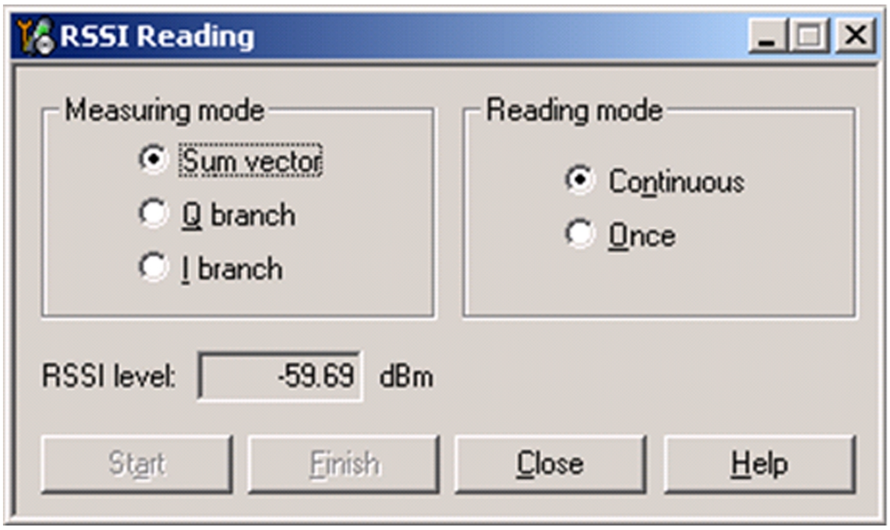
Prerequisites

Make the following settings in Phoenix service software:

Setting	GSM850	GSM900	GSM1800	GSM1900
Phoenix Channel	190	37	700	661
Signal generator to antenna connector	881.66771MHz (67.71kHz offset) at -60dBm	942.46771MHz (67.71kHz offset) at -60dBm	1842.86771MHz (67.71kHz offset) at -60dBm	1960.06771MHz (67.71kHz offset) at -60dBm

Steps

1. Set the phone to local mode.
2. Activate RSSI reading in Phoenix (**Testing→GSM→RSSI reading**)



RSSI Reading

Measuring mode
● Sum vector
○ Q branch
○ I branch

Reading mode
● Continuous
○ Once

RSSI level: -59.69 dBm

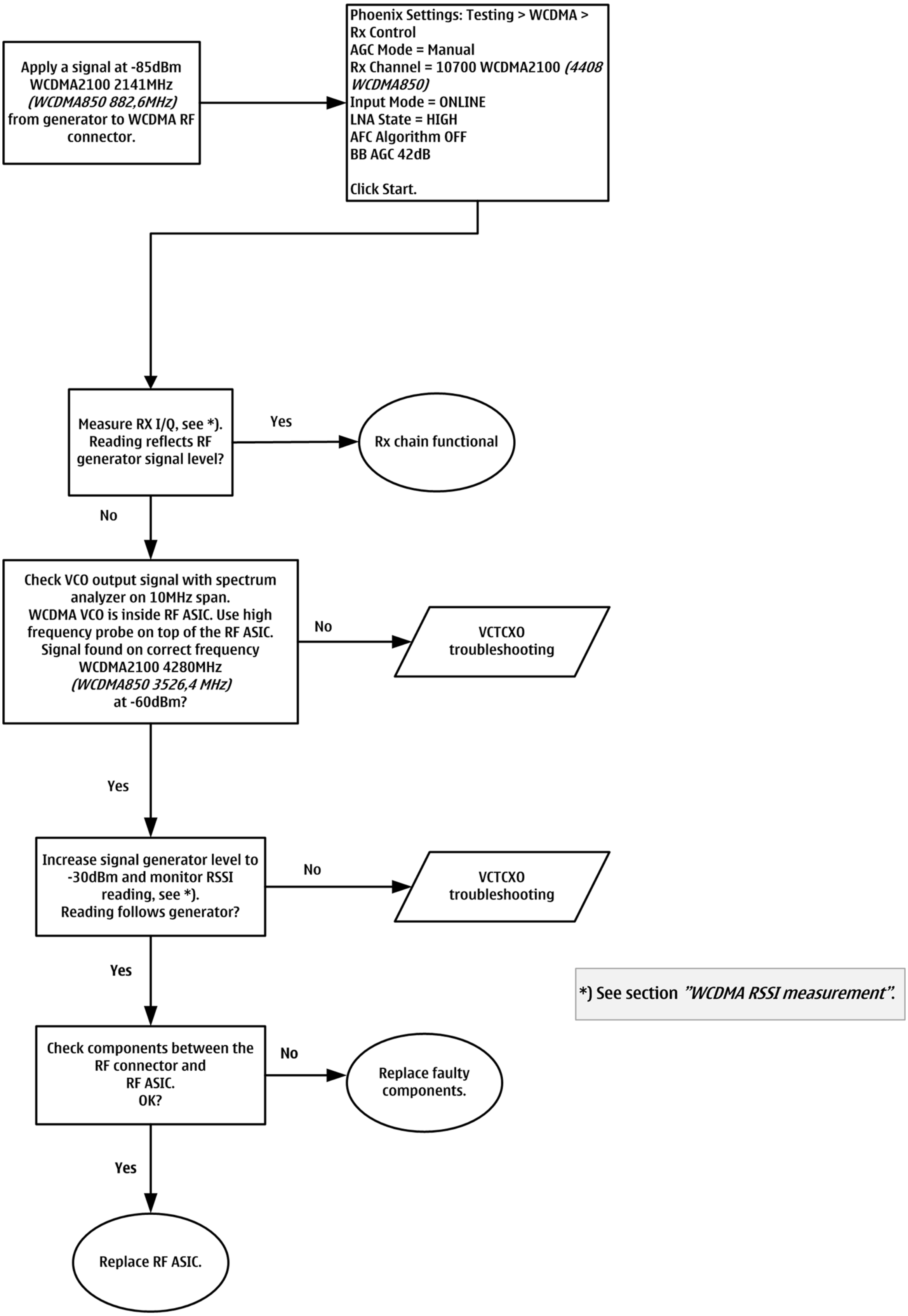
Results

The reading should reflect the level of the signal generator (-losses) +/- 5 dB.

When varying the level in the range -30 to -102 dBm the reading should then follow within +/-5 dB.

WCDMA receiver troubleshooting

Troubleshooting flow


Apply a signal at -85dBm WCDMA2100 2141MHz *(WCDMA850 882,6MHz)* from generator to WCDMA RF connector.
Phoenix Settings: Testing > WCDMA > Rx Control
AGC Mode = Manual
Rx Channel = 10700 WCDMA2100 *(4408 WCDMA850)*
Input Mode = ONLINE
LNA State = HIGH
AFC Algorithm OFF
BB AGC 42dB
Click Start.
Measure RX I/Q, see *). Reading reflects RF generator signal level?
Yes
Rx chain functional
No
Check VCO output signal with spectrum analyzer on 10MHz span. WCDMA VCO is inside RF ASIC. Use high frequency probe on top of the RF ASIC. Signal found on correct frequency WCDMA2100 4280MHz *(WCDMA850 3526,4 MHz)* at -60dBm?
No
VCTCXO troubleshooting
Yes
Increase signal generator level to -30dBm and monitor RSSI reading, see *). Reading follows generator?
No
VCTCXO troubleshooting
Yes
Check components between the RF connector and RF ASIC. OK?
No
Replace faulty components.
Yes
Replace RF ASIC.
*) See section *"WCDMA RSSI measurement".*

WCDMA RX chain activation for manual measurement

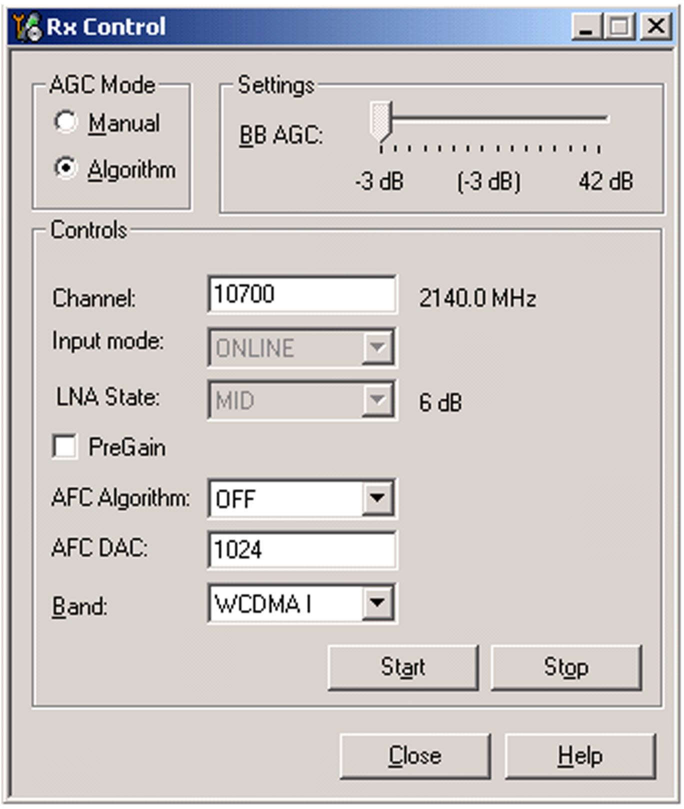
Prerequisites

Make the following settings in Phoenix service software:

Setting	WCDMA band I	WCDMA band V
Phoenix Channel	10700	4408
Signal generator to antenna connector	2141.0 MHz	882.6 MHz
Band	I	V

Steps

1. Via Phoenix Testing menu, choose **WCDMA/RX Control**.
2. In the RX control window, make the following settings:



AGC Mode: ○ Manual ● Algorithm

BB AGC: -3 dB (-3 dB) 42 dB

Channel: 10700 2140.0 MHz

Input mode: ONLINE

LNA State: MID 6 dB

☐ PreGain

AFC Algorithm: OFF

AFC DAC: 1024

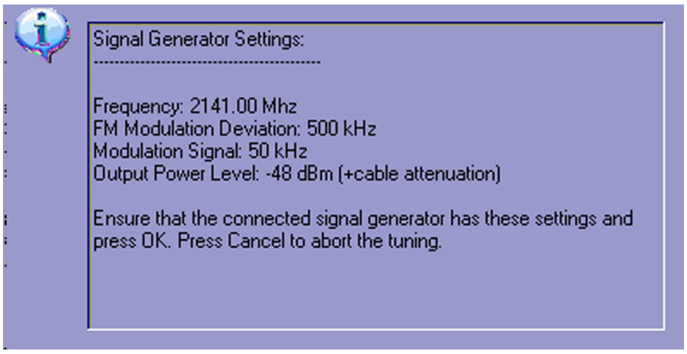
Band: WCDMA I

3. Click **Start** to activate the settings.

   If the settings are changed later on (for example, change of channel) you have to click **Stop** and **Start** again.

   Note: Clicking **Stop** also disables TX control if it was active.

4. Set the following RF generator settings:



Signal Generator Settings:

Frequency: 2141.00 Mhz
FM Modulation Deviation: 500 kHz
Modulation Signal: 50 kHz
Output Power Level: -48 dBm (+cable attenuation)

Ensure that the connected signal generator has these settings and press OK. Press Cancel to abort the tuning.

Figure 20 WCDMA RX generator settings

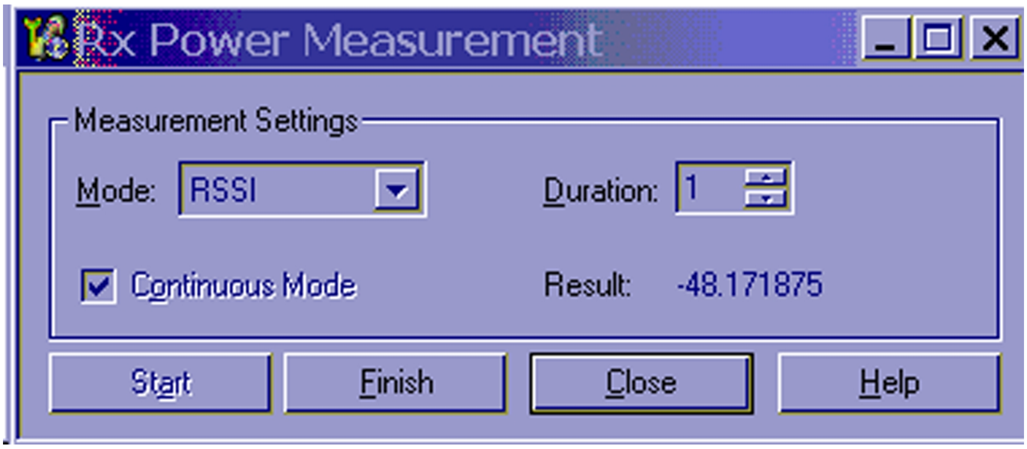
WCDMA RSSI measurement

Prerequisites

WCDMA RX must be activated before RSSI can be measured. For instructions, please refer to WCDMA RX chain activation (page 4– 0).

Steps

1. From the Phoenix testing menu, select **WCDMA→RX Power measurement**
2. In the RX Power measurement window, select:
   - Mode: RSSI
   - Continuous mode



Mode: RSSI
Duration: 1
☑ Continuous Mode
Result: -48.171875

3. Click **Start** to perform the measurement.

Transmitter troubleshooting

General instructions for transmitter (TX) troubleshooting

Please note the following before performing transmitter tests:

- TX troubleshooting requires TX operation.
- Do not transmit on frequencies that are in use!
- The transmitter can be controlled in local mode for diagnostic purposes.
- The most useful Phoenix tool for GSM transmitter testing is “RF Controls”; in WCDMA transmitter testing the best tool is “TX Control”.
- Remember that re-tuning is not a fix! Phones are tuned correctly in production

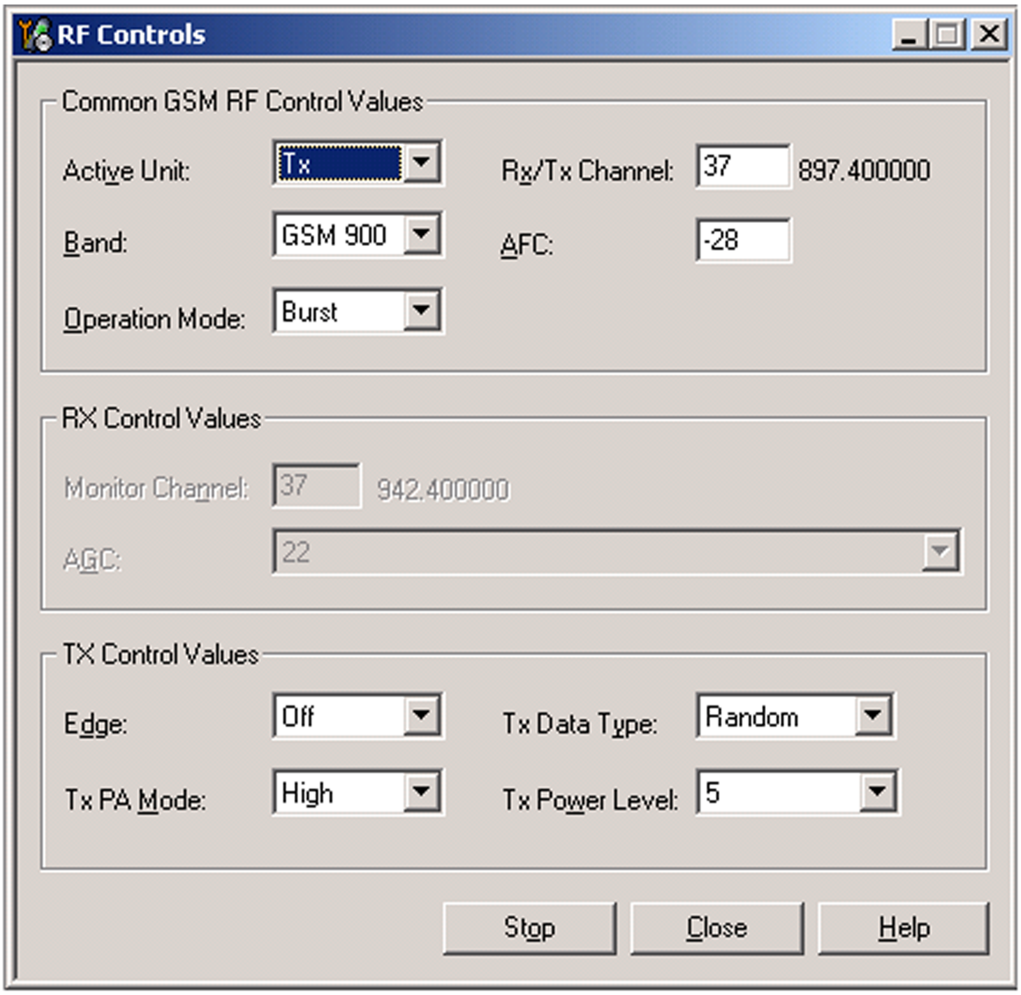
Note: Never activate the GSM or WCDMA transmitter without a proper antenna load. Always connect a 50 Ω load to the RF connector (antenna, RF-measurement equipment or at least a 2 W dummy load); otherwise the GSM or WCDMA Power amplifier (PA) may be damaged.

GSM transmitter troubleshooting

Steps

1. Set the phone to local mode.
2. Activate RF controls in Phoenix (**Testing→GSM→Rf Controls**).

   Use the following settings:

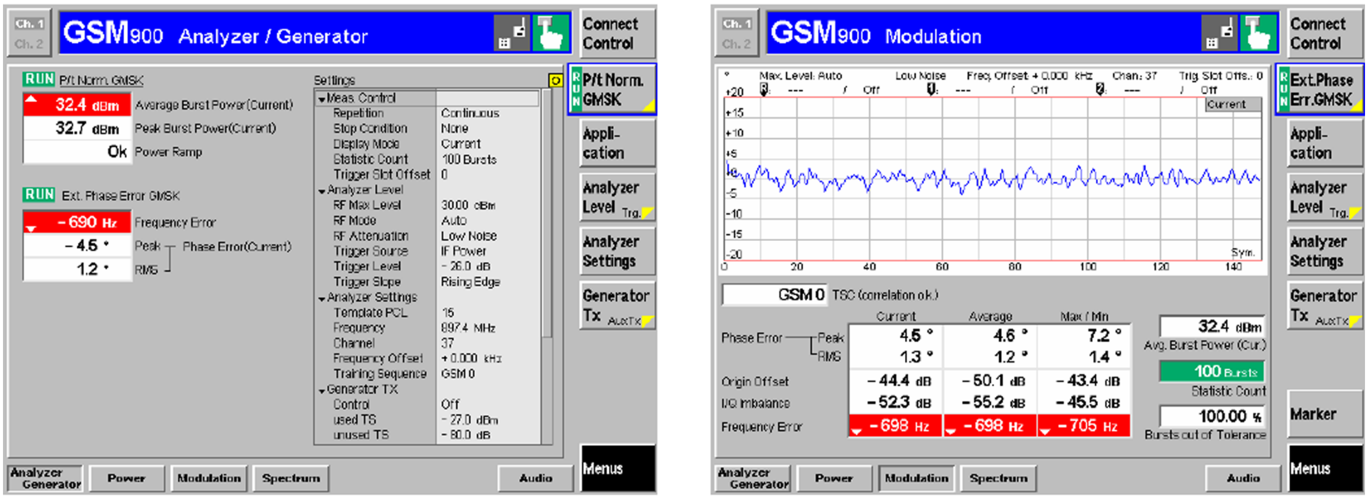


Common GSM RF Control Values
Active Unit: Tx
Rx/Tx Channel: 37 897.400000
Band: GSM 900
AFC: -28
Operation Mode: Burst

RX Control Values
Monitor Channel: 37 942.400000
AGC: 22

TX Control Values
Edge: Off
Tx Data Type: Random
Tx PA Mode: High
Tx Power Level: 5

3. Check the basic TX parameters (i.e. power, phase error, modulation and switching spectrum), using a communication analyser (for example CMU200).



Analyser settings

GSM900 Analyzer / Generator

RUN P/t Norm. GMSK

32.4 dBm Average Burst Power(Current)
32.7 dBm Peak Burst Power(Current)
Ok Power Ramp

RUN Ext. Phase Error GMSK

−690 Hz Frequency Error
−4.5 ° Peak Phase Error(Current)
1.2 ° RMS

Settings

Meas. Control	
Repetition	Continuous
Stop Condition	None
Display Mode	Current
Statistic Count	100 Bursts
Trigger Slot Offset	0
Analyzer Level	
RF Max Level	30.00 dBm
RF Mode	Auto
RF Attenuation	Low Noise
Trigger Source	IF Power
Trigger Level	−26.0 dB
Trigger Slope	Rising Edge
Analyzer Settings	
Template PCL	15
Frequency	897.4 MHz
Channel	37
Frequency Offset	+0.000 kHz
Training Sequence	GSM 0
Generator TX	
Control	Off
used TS	−27.0 dBm
unused TS	−80.0 dB

Phase error

GSM900 Modulation

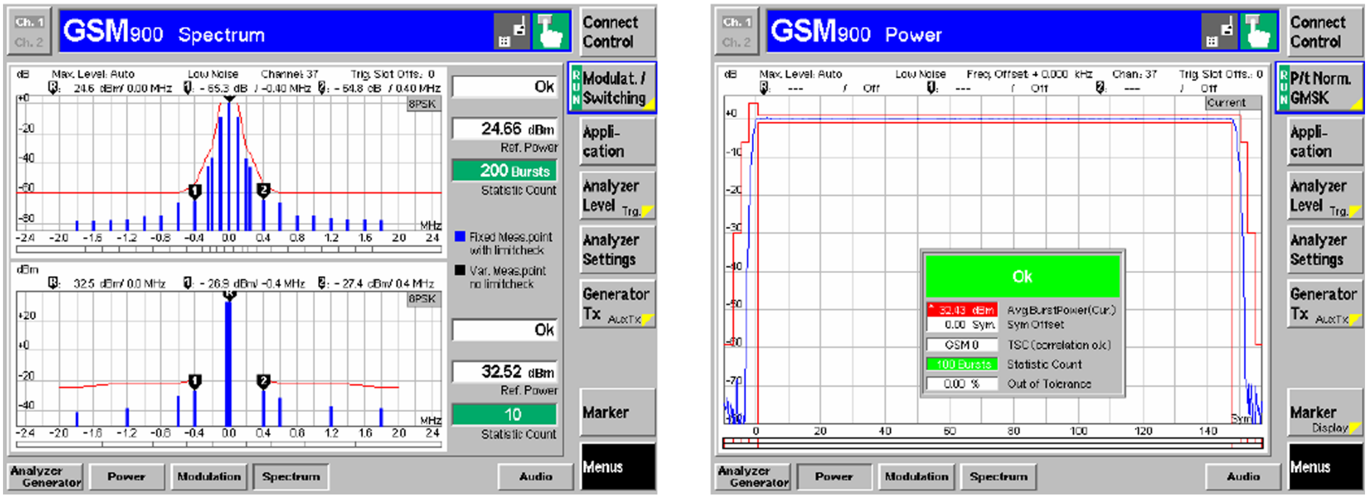
Max. Level: Auto Low Noise Freq. Offset: +0.000 kHz Chan.: 37 Trig. Slot Offs.: 0

GSM 0 TSC (correlation o.k.)

		Current	Average	Max / Min
Phase Error	Peak	4.5 °	4.6 °	7.2 °
	RMS	1.3 °	1.2 °	1.4 °
Origin Offset		−44.4 dB	−50.1 dB	−43.4 dB
I/Q Imbalance		−52.3 dB	−55.2 dB	−45.5 dB
Frequency Error		−698 Hz	−698 Hz	−705 Hz

32.4 dBm Avg. Burst Power (Cur.)
100 Bursts Statistic Count
100.00 % Bursts out of Tolerance

Ch. 1
Ch. 2
Connect Control
P/t Norm. GMSK
Ext.Phase Err.GMSK
Appli-cation
Analyzer Level Trg.
Analyzer Settings
Generator Tx AuxTx
Marker
Menus
Analyzer Generator
Power
Modulation
Spectrum
Audio
Current
Sym.
+20
+15
+10
+5
0
-5
-10
-15
-20
0
20
40
60
80
100
120
140



Modulation/Switching spectrum

GSM900 Spectrum

Max. Level: Auto Low Noise Channel: 37 Trig. Slot Offs.: 0
R: 24.6 dBm/ 0.00 MHz 1: −65.3 dB / −0.40 MHz 2: −64.8 dB / 0.40 MHz

Ok
24.66 dBm Ref. Power
200 Bursts Statistic Count

■ Fixed Meas.point with limitcheck
■ Var. Meas.point no limitcheck

R: 32.5 dBm/ 0.0 MHz 1: −26.9 dBm/ −0.4 MHz 2: −27.4 dBm/ 0.4 MHz

Ok
32.52 dBm Ref. Power
10 Statistic Count

Power/Burst

GSM900 Power

Max. Level: Auto Low Noise Freq. Offset: +0.000 kHz Chan.: 37 Trig. Slot Offs.: 0

Ok
32.43 dBm AvgBurstPower(Cur.)
0.00 Sym. Sym Offset
GSM 0 TSC (correlation o.k.)
100 Bursts Statistic Count
0.00 % Out of Tolerance

Ch. 1
Ch. 2
Connect Control
Modulat. / Switching
P/t Norm. GMSK
Appli-cation
Analyzer Level Trg.
Analyzer Settings
Generator Tx AuxTx
Marker
Marker Display
Menus
Analyzer Generator
Power
Modulation
Spectrum
Audio
dB
dBm
8PSK
Current
MHz
Sym.
+0
-20
-40
-60
-80
+20
-10
-30
-50
-70
-2.4
-2.0
-1.6
-1.2
-0.8
-0.4
0.0
0.4
0.8
1.2
1.6
2.0
2.4
0
20
40
60
80
100
120
140

Figure 21 Typical readings

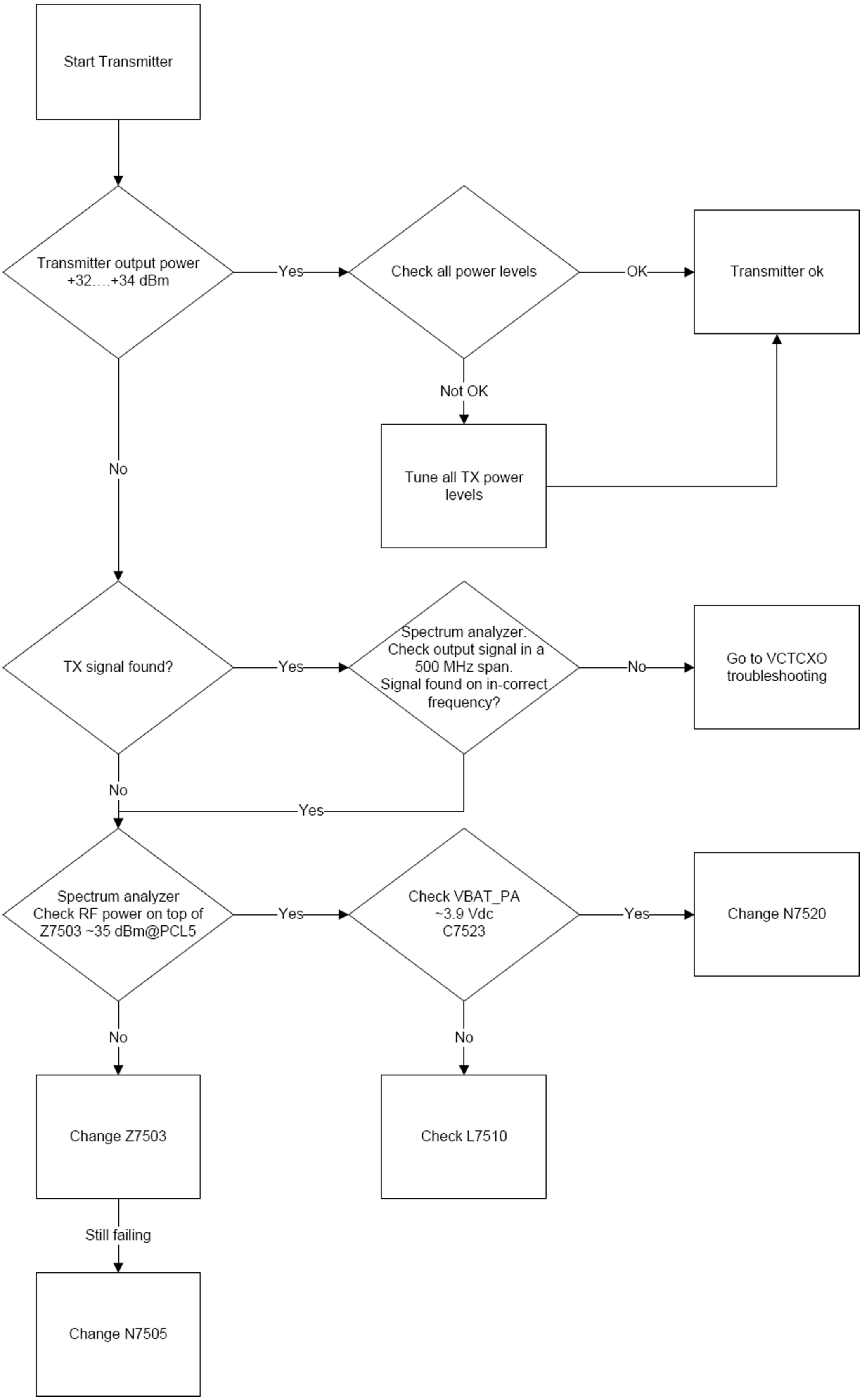
4. Change the power level (RF controls) and make sure the power reading follows accordingly.

Next actions

You can troubleshoot the GSM transmitter for each GSM band separately, one band at a time. If you want to troubleshoot GSM850, GSM1800 or GSM1900, change the band with the RF controls and set the communication analyser accordingly.

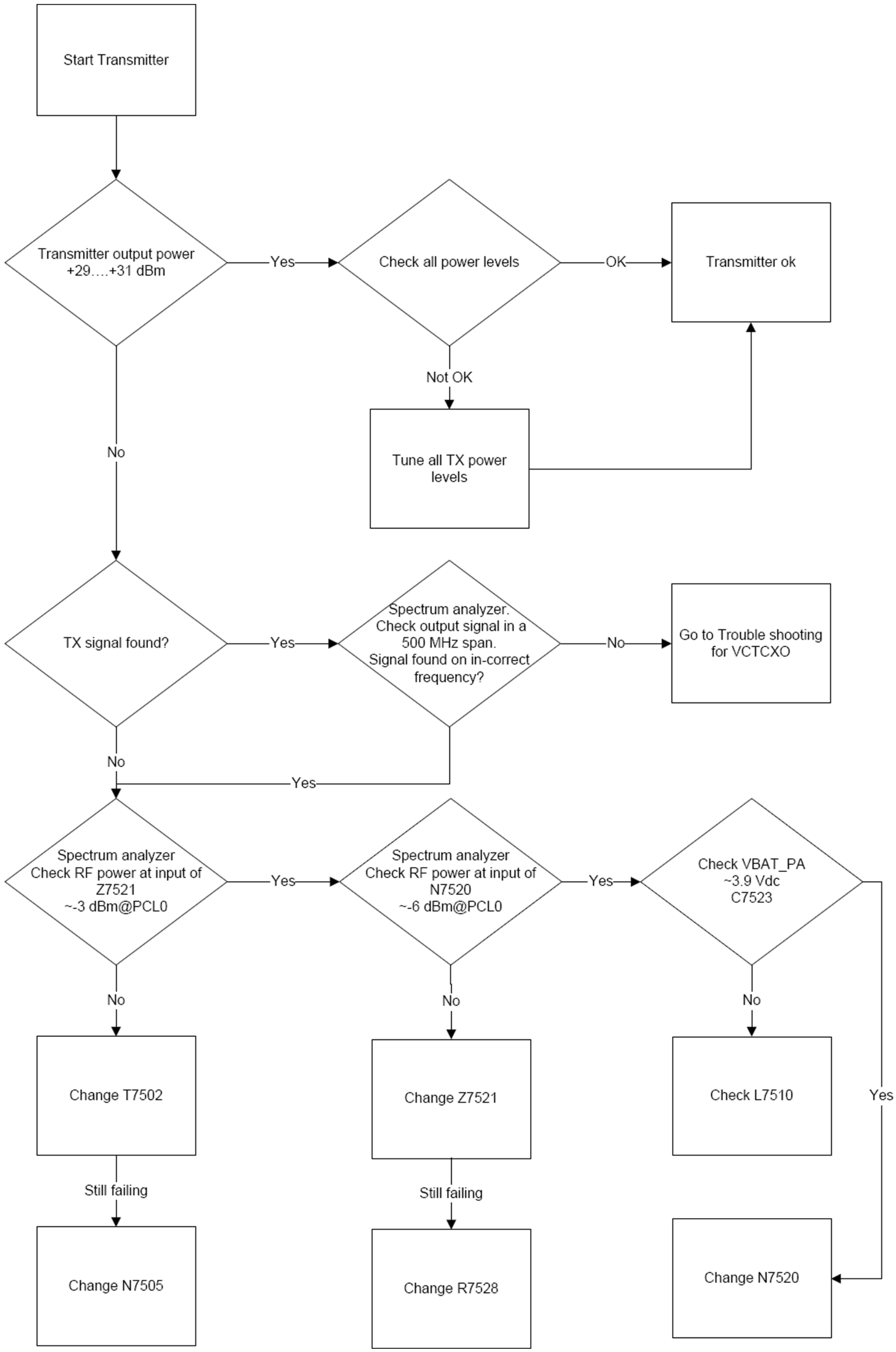
TX 850/900 troubleshooting

Troubleshooting flow


Start Transmitter
Transmitter output power +32….+34 dBm
Yes
Check all power levels
OK
Transmitter ok
Not OK
Tune all TX power levels
No
TX signal found?
Yes
Spectrum analyzer. Check output signal in a 500 MHz span. Signal found on in-correct frequency?
No
Go to VCTCXO troubleshooting
No
Yes
Spectrum analyzer Check RF power on top of Z7503 ~35 dBm@PCL5
Yes
Check VBAT_PA ~3.9 Vdc C7523
Yes
Change N7520
No
No
Change Z7503
Check L7510
Still failing
Change N7505

TX 1800/1900 troubleshooting

Troubleshooting flow


Start Transmitter
Transmitter output power +29….+31 dBm
Yes
Check all power levels
OK
Transmitter ok
Not OK
Tune all TX power levels
No
TX signal found?
Yes
Spectrum analyzer. Check output signal in a 500 MHz span. Signal found on in-correct frequency?
No
Go to Trouble shooting for VCTCXO
No
Yes
Spectrum analyzer Check RF power at input of Z7521 ~-3 dBm@PCL0
Yes
Spectrum analyzer Check RF power at input of N7520 ~-6 dBm@PCL0
Yes
Check VBAT_PA ~3.9 Vdc C7523
No
No
No
Yes
Change T7502
Change Z7521
Check L7510
Still failing
Still failing
Change N7505
Change R7528
Change N7520

Checking antenna functionality

Antenna overview

The phone has a main GSM+WCDMA antenna and a BT antenna.

The main antenna assembly consists of an antenna frame with a pattern plated onto the plastic. There is one feed and one GND contact on the antenna frame.

The BT antenna assembly consists of a BT frame and a BT flex.

Main antenna functionality

The main GSM+WCDMA antenna is functioning normally when the feed and GND contacts take proper contact to the PWB's C-clips and the plated pattern is visually intact on the antenna frame.

The main antenna functionality must also be checked by measuring the transmitted power with RF coupler at WCDMA2100 channel 9888.

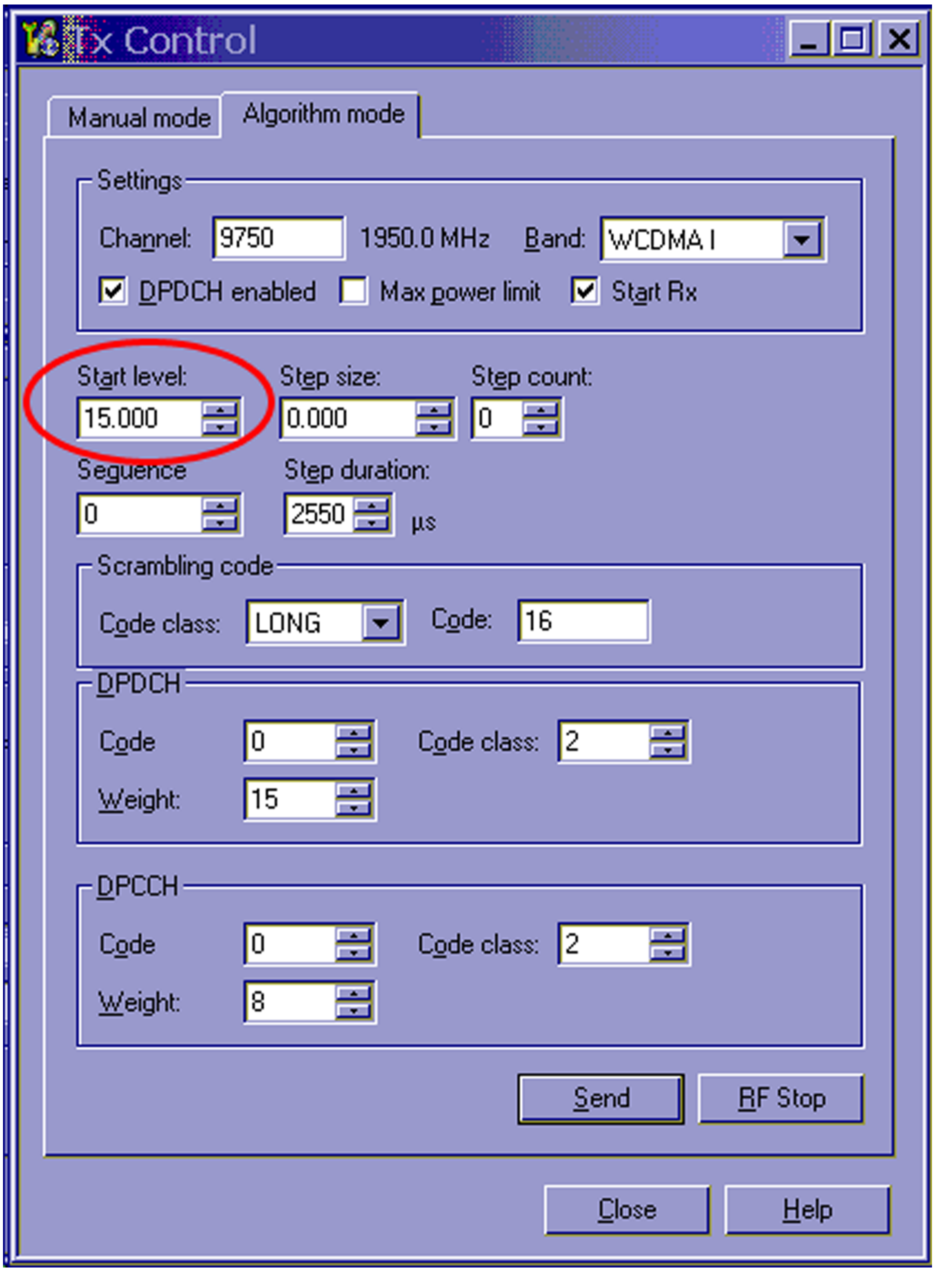
BT antenna functionality

The BT antenna is functioning normally when the BT antenna contact take proper contact to the PWB's C-clip, the BT flex is intact and the BT antenna assembly is firmly mounted into the C-cover.

WCDMA transmitter troubleshooting

Steps

1. Set the phone to local mode.
2. In Phoenix, select **Testing→WCDMA→TX control** .
3. Use the following settings in the TX control window:



Settings

Channel: 9750 1950.0 MHz Band: WCDMA I

☑ DPDCH enabled ☐ Max power limit ☑ Start Rx

Start level: 15.000

Step size: 0.000

Step count: 0

Sequence: 0

Step duration: 2550 µs

Scrambling code

Code class: LONG Code: 16

DPDCH

Code 0 Code class: 2

Weight: 15

DPCCH

Code 0 Code class: 2

Weight: 8

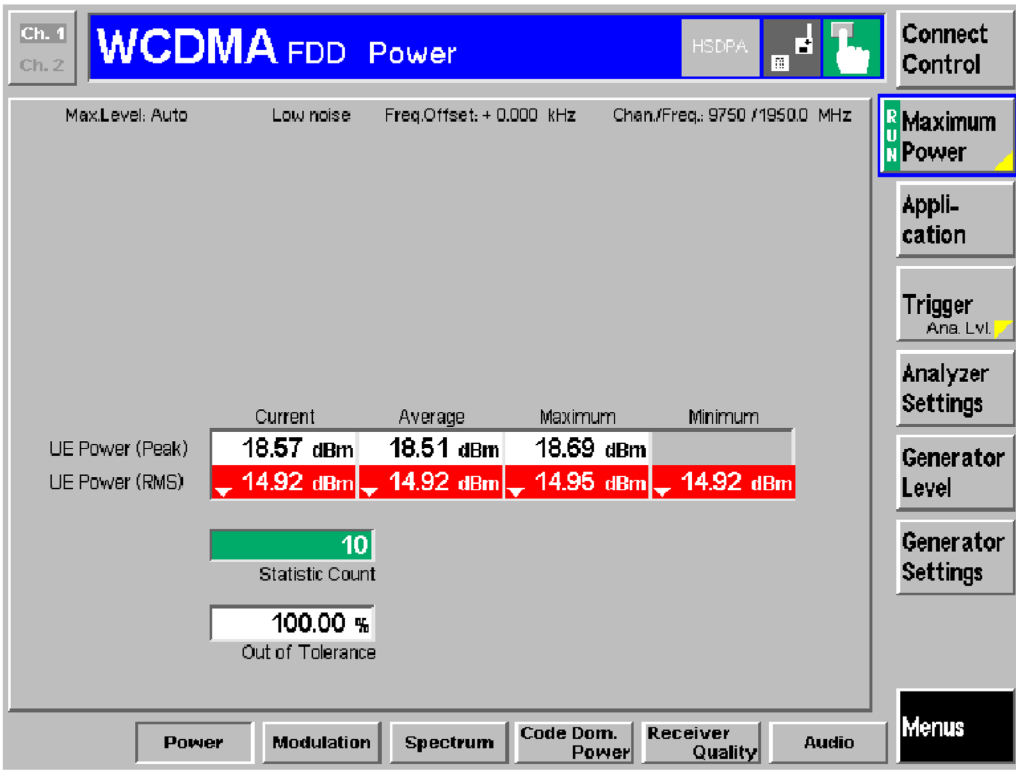
Figure 22 Phoenix WCDMA TX control window

Note: Use the **Start level** option to set the TX power level.

4. Click **Send** to enable the settings and activate TX.

   If settings are changed (eg. new channel), you have to click **RF Stop** and **Send** again.

5. Use the CMU200 to check the WCDMA power.


Ch. 1
Ch. 2
WCDMA FDD Power
HSDPA
Connect Control
RUN
Maximum Power
Appli-cation
Trigger
Ana. Lvl.
Analyzer Settings
Generator Level
Generator Settings
Menus
Power
Modulation
Spectrum
Code Dom. Power
Receiver Quality
Audio

Max.Level: Auto
Low noise
Freq.Offset: + 0.000 kHz
Chan./Freq.: 9750 / 1950.0 MHz

	Current	Average	Maximum	Minimum
UE Power (Peak)	18.57 dBm	18.51 dBm	18.69 dBm	
UE Power (RMS)	14.92 dBm	14.92 dBm	14.95 dBm	14.92 dBm

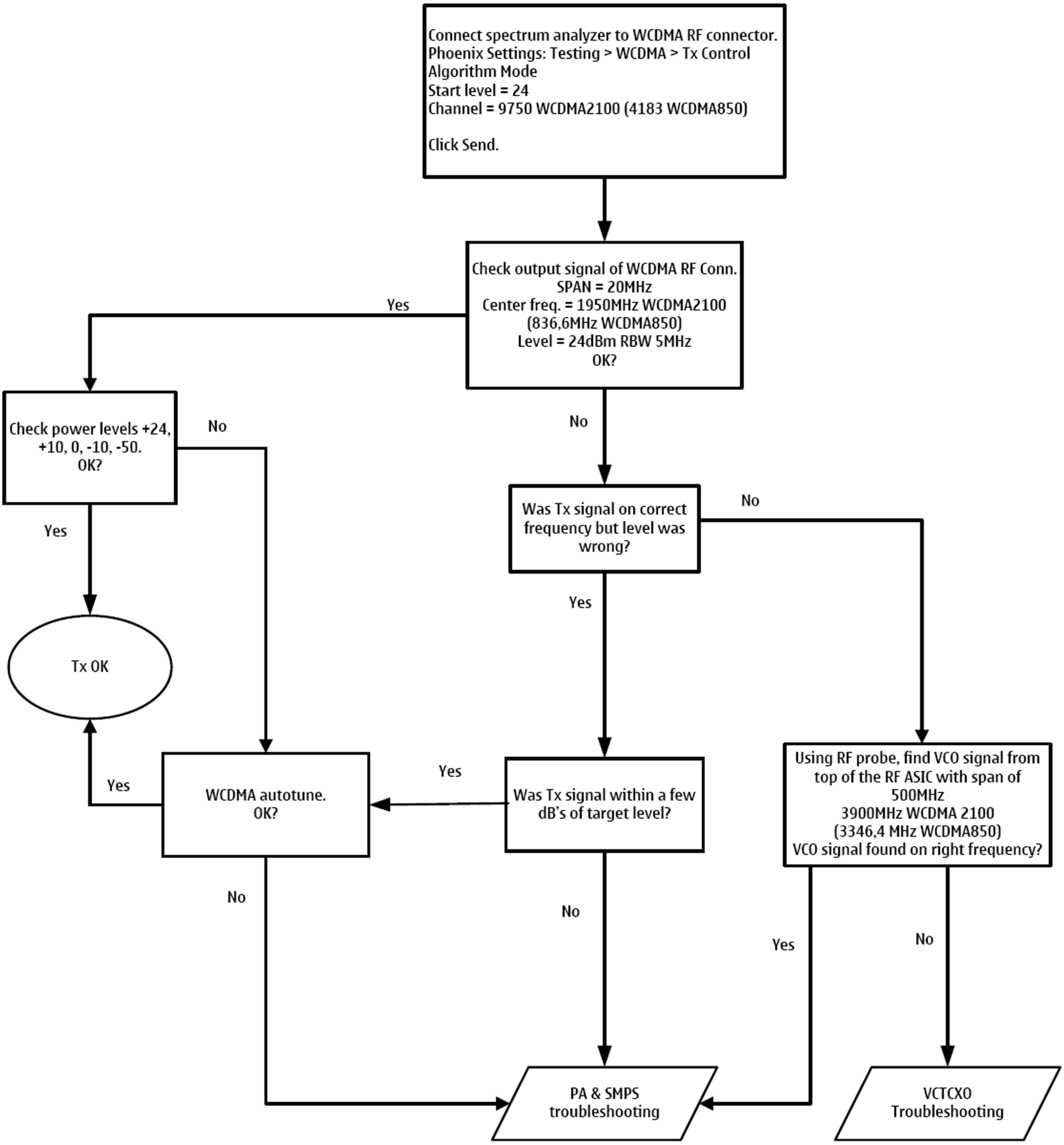
10
Statistic Count

100.00 %
Out of Tolerance

Figure 23 WCDMA power window

WCDMA transmitter troubleshooting flowchart

Troubleshooting flow


Connect spectrum analyzer to WCDMA RF connector.
Phoenix Settings: Testing > WCDMA > Tx Control
Algorithm Mode
Start level = 24
Channel = 9750 WCDMA2100 (4183 WCDMA850)
Click Send.
Check output signal of WCDMA RF Conn.
SPAN = 20MHz
Center freq. = 1950MHz WCDMA2100
(836,6MHz WCDMA850)
Level = 24dBm RBW 5MHz
OK?
Yes
Check power levels +24, +10, 0, -10, -50.
OK?
No
No
Yes
Was Tx signal on correct frequency but level was wrong?
No
Yes
Tx OK
Using RF probe, find VCO signal from top of the RF ASIC with span of 500MHz
3900MHz WCDMA 2100
(3346,4 MHz WCDMA850)
VCO signal found on right frequency?
Yes
WCDMA autotune.
OK?
Yes
Was Tx signal within a few dB's of target level?
No
No
Yes
No
PA & SMPS troubleshooting
VCTCXO Troubleshooting

RF tunings

Introduction to RF tunings

Important: Only perform RF tunings if:

- one or more of the RF components have been replaced
- flash memory chip is replaced or corrupted.

RF calibration is always performed with the help of a product-specific module jig, never with an RF coupler. Using an RF coupler in the calibration phase will cause a complete mistuning of the RF part.

Important: After RF component replacements, **always** use autotuning. Manual tunings are only required in rare cases.

Cable and adapter losses

RF cables and adapters have some losses. They have to be taken into account when the phone is tuned. As all RF losses are frequency dependent, the user has to act very carefully and understand the measurement setup.

Autotuning for BB5

This phone can be tuned automatically.

Autotune is designed to align the phone's RF part easier and faster. It performs calibrations, tunings and measurements of RX and TX. The results are displayed and logged in a result file, if initiated.

Hardware set up

Hardware requirements for auto tuning:

- PC (Windows 2000/XP) with GPIB card
- Power supply
- Product specific module jig
- Cables: XRS-6 (RF cable that requires an additional product-specific adapter cable), USB cable, GBIP cable and DAU-9S
- Signal analyser (TX), signal generator (RX) and RF-splitter *or* one device including all.

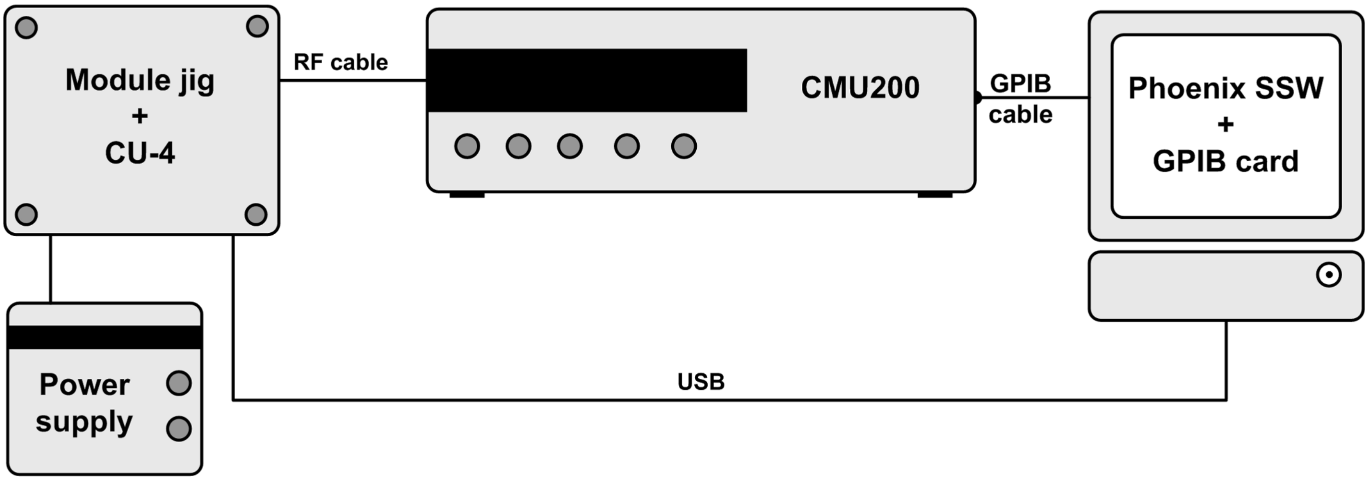


Figure 24 Auto tuning concept with CMU200

Phoenix preparations

Install the phone-specific data package. This defines the phone-specific settings.

Auto tuning procedure

1 Make sure the phone (in the jig) is connected to the equipment. Else, some menus will not be shown in Phoenix.

2. To go to autotune, select *Tuning (Alt-U)* > *Auto-Tune (Alt-A)* from the menu.
3. Remember to set the correct attenuation values before autotuning.
4. To start autotuning, click the *Tune* button.

System mode independent manual tunings

RF channel filter calibration

Context

Rf channel filter calibration tunes the internal low pass filters of the RF ASIC, that limit the bandwidth of BB IQ signals.

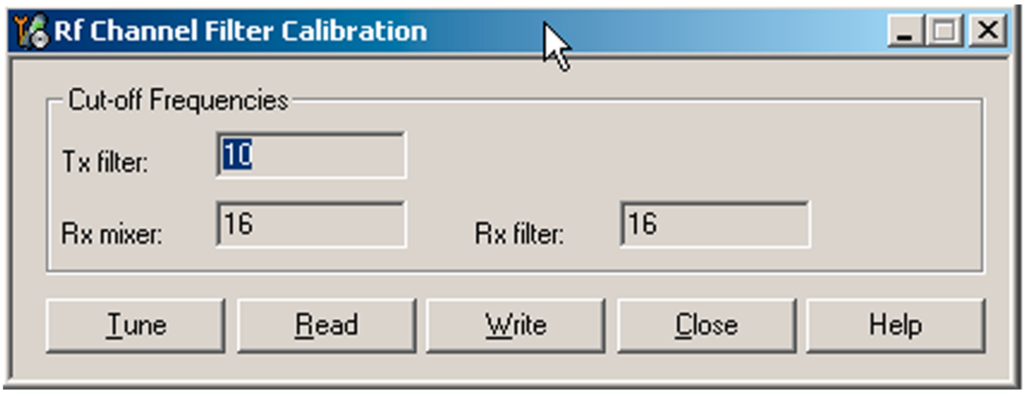
Table 11 Rf channel filter calibration tuning limits

	Min	Typ	Max
Tx filter	0	10	31
RX mixer	0	13	31
Rx filter	0	16	31

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→Rf Channel Filter Calibration** .
3. Click **Tune**.
4. To save the values to the PMM (Phone Permanent Memory) area, click **Write**.
5. To close the *Rf Channel Filter Calibration* window, click **Close**.

Results



Cut-off Frequencies
Tx filter: 10
Rx mixer: 16
Rx filter: 16

Figure 25 Rf channel filter calibration typical values

PA (power amplifier) detection

Context

The PA detection procedure detects which PA manufacturer is used for phone PAs.

If a PA is changed or if the permanent memory (PMM) data is corrupted, PA detection has to be performed before Tx tunings.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→PA Detection** .
3. Click **Tune**.
4. Check that the detected PA manufacturers are corresponding to the actual chips on the board.
5. To end the procedure, click **Close**.

GSM receiver tunings

Rx calibration (GSM)

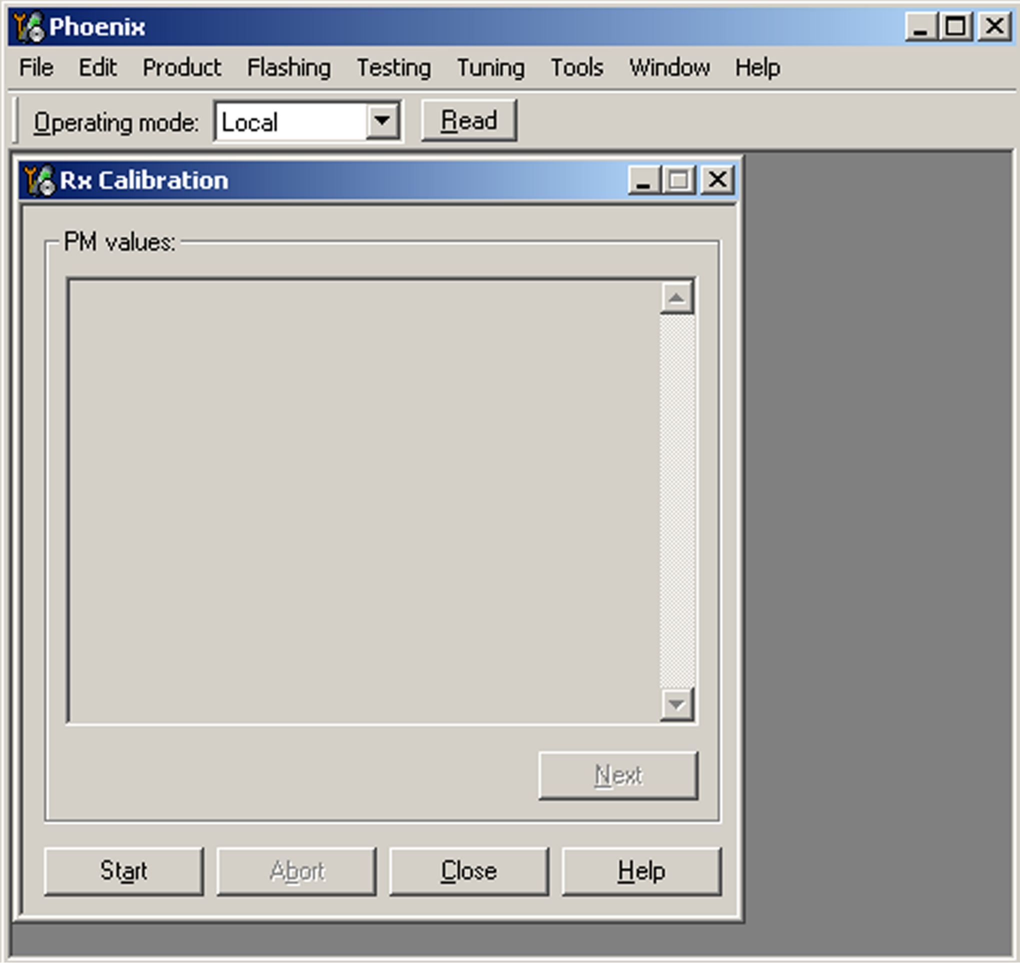
Context

Rx Calibration is used to find out the real gain values of the GSM Rx AGC system and tuning response of the AFC system (AFC D/A init value and AFC slope)

Steps

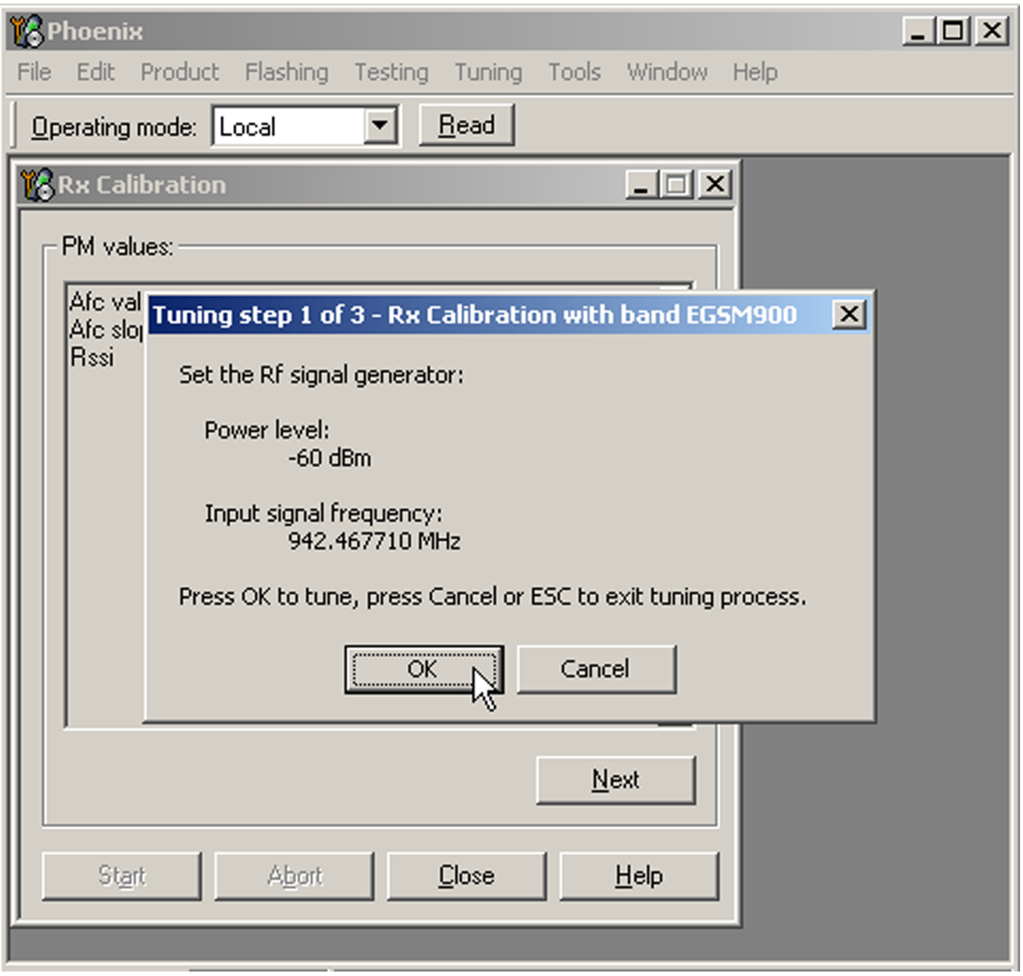
1. Connect the GSM connector of the module jig to a signal generator.
2. Start *Phoenix* service software.
3. From the **Operating mode** drop-down menu, set mode to **Local**.
4. Choose **Tuning→GSM→Rx Calibration** .

5. Click **Start**.


Phoenix
File Edit Product Flashing Testing Tuning Tools Window Help
Operating mode: Local
Read
Rx Calibration
PM values:
Next
Start
Abort
Close
Help

6. Connect the signal generator to the phone, and set frequency and amplitude as instructed in the **Rx Calibration with band EGSM900** (step 1-3) pop-up window.

   Important: The calibration uses a non-modulated CW signal. Increase the signal generator level by cable attenuation and module jig probe attenuation.


Phoenix
File Edit Product Flashing Testing Tuning Tools Window Help
Operating mode: Local
Read
Rx Calibration
PM values:
Afc val
Afc slo
Rssi
Next
Start
Abort
Close
Help
OK
Cancel

Tuning step 1 of 3 - Rx Calibration with band EGSM900

Set the Rf signal generator:

Power level:
-60 dBm

Input signal frequency:
942.467710 MHz

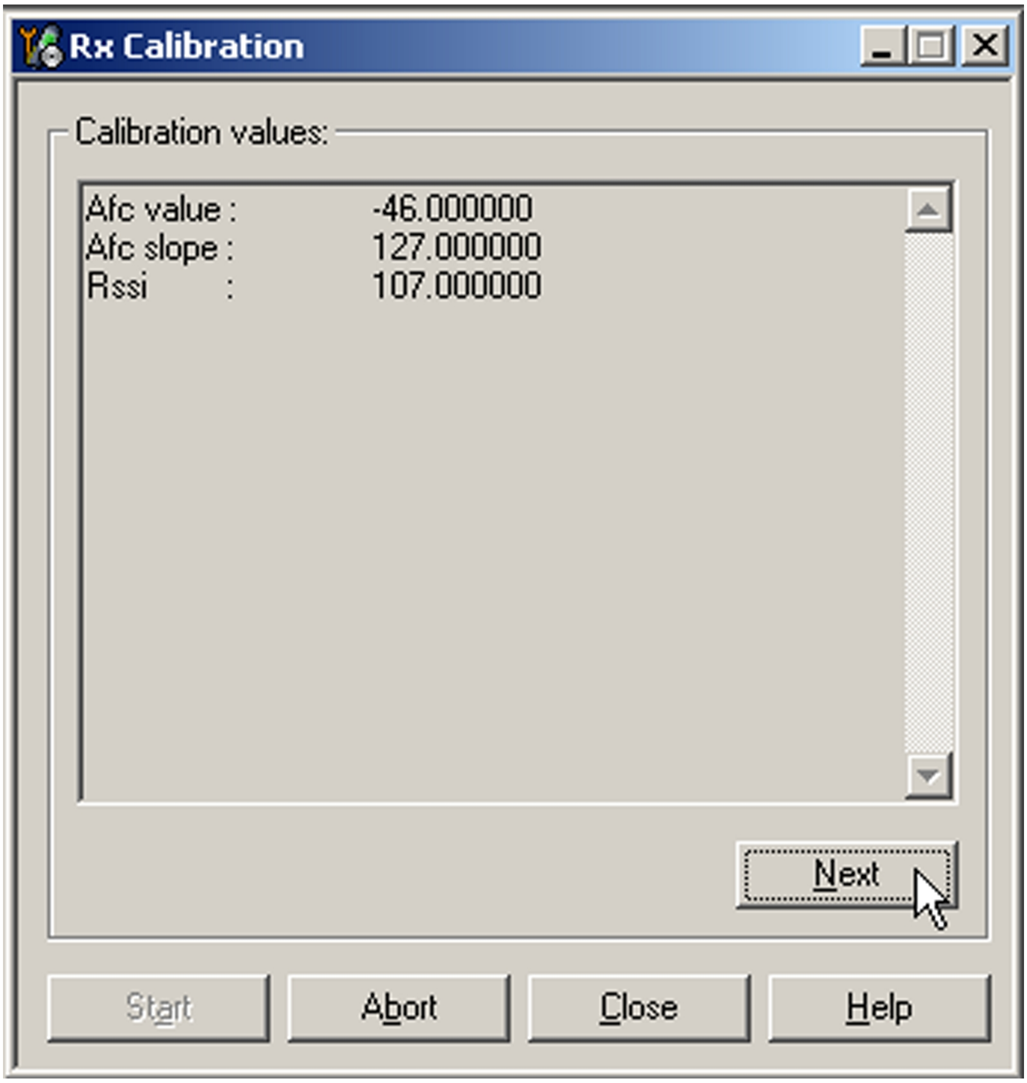
Press OK to tune, press Cancel or ESC to exit tuning process.

7. To perform the tuning, click **OK**.
8. Check that the tuning values are within the limits specified in the following table:

Table 12 RF tuning limits in Rx calibration

	Min	Typ	Max	Unit
GSM850				
AFC Value (init)	-200	-80..40	200	dB
AFC slope	0	108..121	200	dB
RSSI (AGC-0)	106	107..110	114	dB
GSM900				
AFC Value (init)	-200	-105..62	200	dB
AFC slope	0	122	200	dB
RSSI (AGC-0)	106	107...110	114	dB
GSM1800				
RSSI (AGC-0)	105	105...109	114	dB
GSM1900				
RSSI (AGC-0)	105	105...109	114	dB

9. Click **Next** to continue with GSM1800 Rx tuning.



Afc value : -46.000000
Afc slope : 127.000000
Rssi : 107.000000

Next actions

Repeat steps 6 to 9for GSM1800 and GSM1900

Rx band filter response compensation (GSM)

Prerequisites

Rx calibration must be performed before the Rx band filter response compensation.

Context

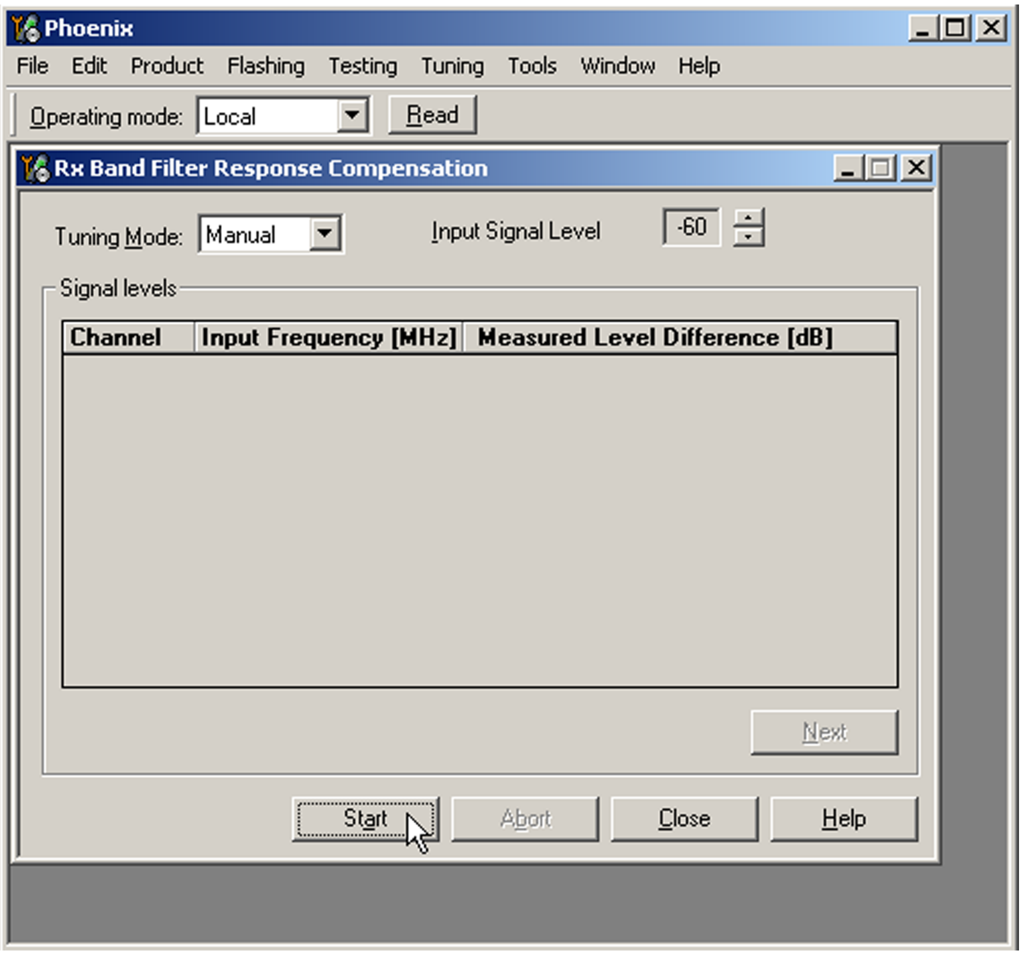
On each GSM Rx band, there is a band filter in front of the RF ASIC front end. The amplitude ripple caused by these filters causes ripple to the RSSI measurement, and therefore calibration is needed.

The calibration has to be repeated for each GSM band.

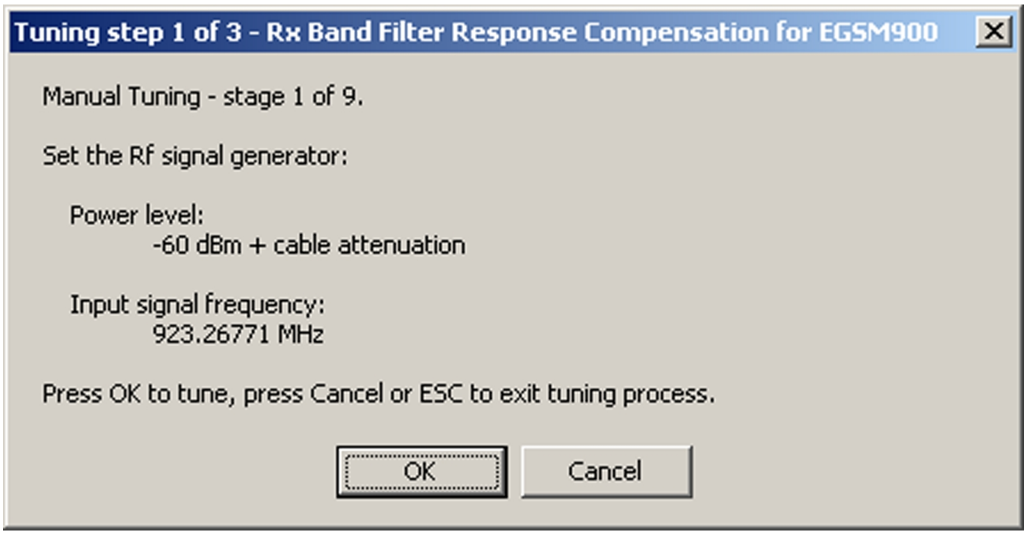
Steps

1. Connect the GSM connector of the module jig to a signal generator.
2. Start *Phoenix* service software.
3. From the **Operating mode** drop-down menu, set mode to **Local**.

4. Select **GSM900** band.
5. Choose **Tuning→GSM→Rx Band Filter Response Compensation** .
6. Select **Tuning mode: manual**
7. Click **Start**.


Phoenix
File Edit Product Flashing Testing Tuning Tools Window Help
Operating mode: Local
Read
Rx Band Filter Response Compensation
Tuning Mode: Manual
Input Signal Level -60
Signal levels
Channel
Input Frequency [MHz]
Measured Level Difference [dB]
Next
Start
Abort
Close
Help

8. Connect the signal generator to the phone, and set frequency and amplitude as instructed in the *Rx Band Filter Response Compensation for EGSM900* pop-up window, step 1-3.


Tuning step 1 of 3 - Rx Band Filter Response Compensation for EGSM900

Manual Tuning - stage 1 of 9.

Set the Rf signal generator:

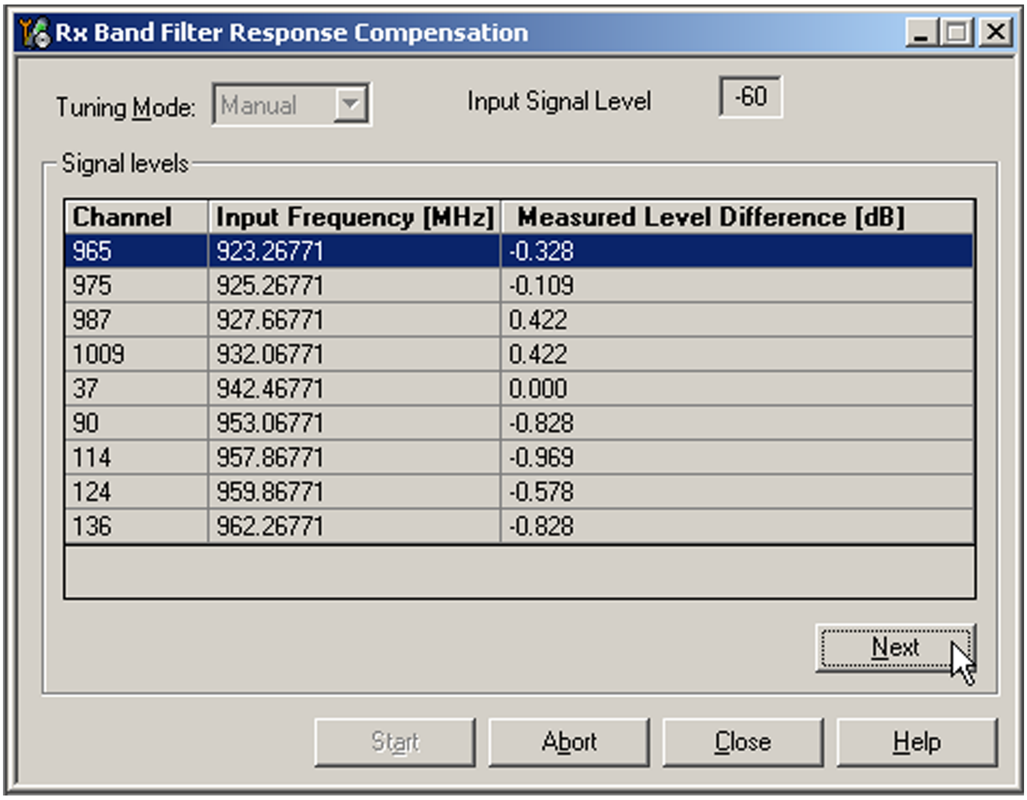
Power level:
-60 dBm + cable attenuation

Input signal frequency:
923.26771 MHz

Press OK to tune, press Cancel or ESC to exit tuning process.

OK
Cancel

9. To perform tuning, click **OK**.
10. Go through all 9 frequencies. The following table will be shown:



Tuning Mode: Manual

Input Signal Level -60

Channel	Input Frequency [MHz]	Measured Level Difference [dB]
965	923.26771	-0.328
975	925.26771	-0.109
987	927.66771	0.422
1009	932.06771	0.422
37	942.46771	0.000
90	953.06771	-0.828
114	957.86771	-0.969
124	959.86771	-0.578
136	962.26771	-0.828

11. Check that the tuning values are within the limits specified in the following table:

	Min	Typ	Max	Unit
GSM850				
Ch. 118/867.26771 MHz	-6	-1	2	dB
Ch. 128/869.26771 MHz	-3	0	2	dB
Ch. 140/871.66771 MHz	-3	0	2	dB
Ch. 172/878.06771 MHz	-2	0	2	dB
Ch. 190/881.66771 MHz	-2	0	2	dB
Ch. 217 / 887.06771 MHz	-2	0	2	dB
Ch. 241/891.86771 MHz	-3	0	2	dB
Ch. 251/893.86771 MHz	-3	0	2	dB
Ch. 261/895.86771 MHz	-6	-1	-2	dB
GSM900				
Ch. 965 / 923.26771 MHz	-6	-1	2	dB
Ch. 975 / 925.26771 MHz	-3	0	2	dB
Ch. 987 / 927.66771 MHz	-3	0	2	dB
Ch. 1009 / 932.06771 MHz	-2	0	2	dB

	Min	Typ	Max	Unit
Ch. 37 / 942.46771 MHz	-2	0	2	dB
Ch. 90 / 953.06771 MHz	-2	0	2	dB
Ch. 114 / 957.86771 MHz	-3	0	2	dB
Ch. 124 / 959.86771 MHz	-3	0	2	dB
Ch. 136 / 962.26771 MHz	-6	-1	2	dB
GSM1800				
Ch. 497 / 1802.26771 MHz	-6	-1	3	dB
Ch. 512 / 1805.26771 MHz	-3	0	3	dB
Ch. 535 / 1809.86771 MHz	-3	0	3	dB
Ch. 606 / 1824.06771 MHz	-3	0	3	dB
Ch. 700 / 1842.86771 MHz	-3	0	3	dB
Ch. 791 / 1861.06771 MHz	-3	0	3	dB
Ch. 870 / 1876.86771 MHz	-3	0	3	dB
Ch. 885 / 1879.86771 MHz	-3	0	3	dB
Ch. 908 / 1884.46771 MHz	-6	-1	3	dB
GSM1900				
Ch. 496 / 1927.06771 MHz	-6	-1	2	dB
Ch. 512 / 1930.26771 MHz	-3	0	2	dB
Ch. 537 / 1935.26771 MHz	-3	0	2	dB
Ch. 586 / 1945.06771 MHz	-3	0	2	dB
Ch. 661 / 1960.06771 MHz	-3	0	2	dB
Ch. 736 / 1975.06771 MHz	-3	0	2	dB
Ch. 794 / 1986.66771 MHz	-3	0	2	dB
Ch. 810 / 1989.86771 MHz	-3	0	2	dB
Ch. 835 / 1994.86771 MHz	-6	-1	2	dB

12. If the values are within the limits, click **Next** to continue to the next band.

Next actions

Repeat the steps 8 to 12 for GSM1800 and GSM1900.

GSM transmitter tunings

Tx IQ tuning (GSM)

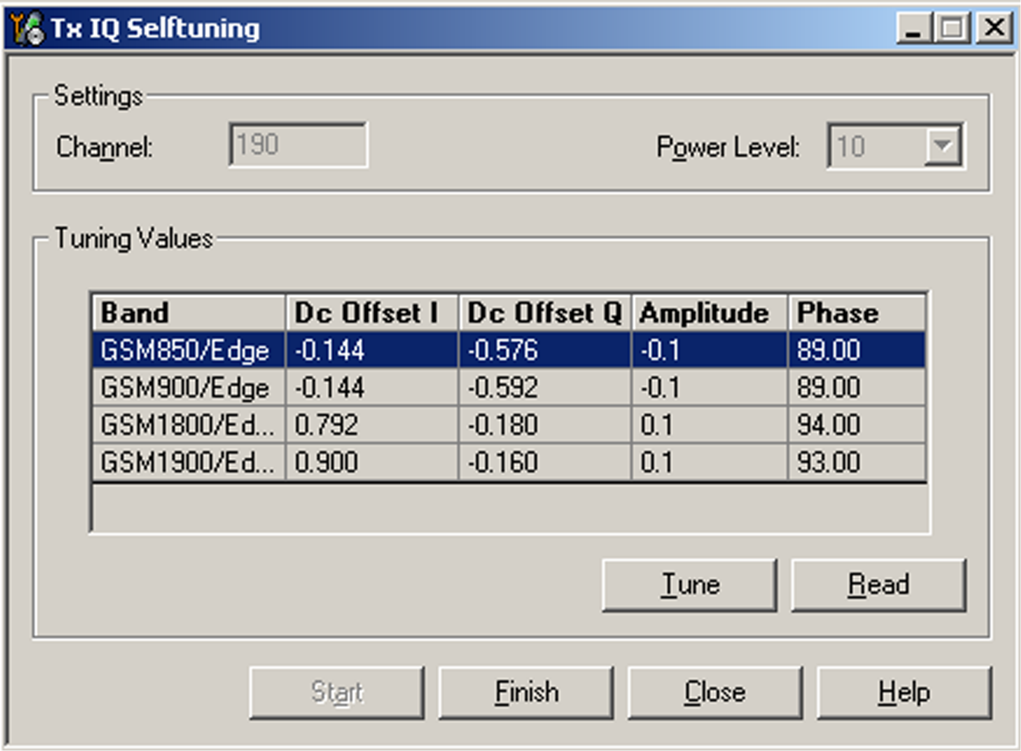
Context

The Tx path branches to I and Q signals at RF I/Q modulator. Modulator and analog hardware located after it cause unequal amplitude and phase disturbance to I and Q signal paths. Tx IQ tuning balances the I and Q branches.

Tx IQ tuning must be performed for all GSM bands.

Steps

1. Start *Phoenix* service software.
2. From the **Operating mode** drop-down menu, set mode to **Local**.
3. Choose **Tuning→GSM→Tx IQ Tuning** .
4. Select **Mode: Automatic**.



Channel: 190

Power Level: 10

Band	Dc Offset I	Dc Offset Q	Amplitude	Phase
GSM850/Edge	-0.144	-0.576	-0.1	89.00
GSM900/Edge	-0.144	-0.592	-0.1	89.00
GSM1800/Ed...	0.792	-0.180	0.1	94.00
GSM1900/Ed...	0.900	-0.160	0.1	93.00

5. Select **Band: GSM900** and click **Start**.
6. Click **Next** to start GSM1800 band TX IQ tuning.
7. Click **Next** to start GSM1900 band TX IQ tuning.
8. Click**Finish** and then **Close**.

Next actions

Tuning sliders should be close to the center of the scale after the tuning and within the limits specified in the following table. If they are not within the limits, check Tx IQ quality manually.

	Min	Typ	Max	Unit
GSM850				
I DC offset / Q DC offset	-6	-4	6	%
Ampl	-1	0	1	dB
Phase	85	90	95	°
GSM900				

	Min	Typ	Max	Unit
I DC offset / Q DC offset	-6	-4	6	%
Ampl	-1	0	1	dB
Phase	85	90	95	°
GSM1800/GSM1900				
I/Q DC	-6	0.5	6	%
Ampl	-1	0	1	dB
Phase	95	100	110	°

Tx power level tuning (GSM)

Context

Because of variations at the IC (Integrated Circuit) process and discrete component values, the actual transmitter RF gain of each phone is different. Tx power level tuning is used to find out mapping factors called 'power coefficients'. These adjust the GSM transmitter output power to fulfill the specifications.

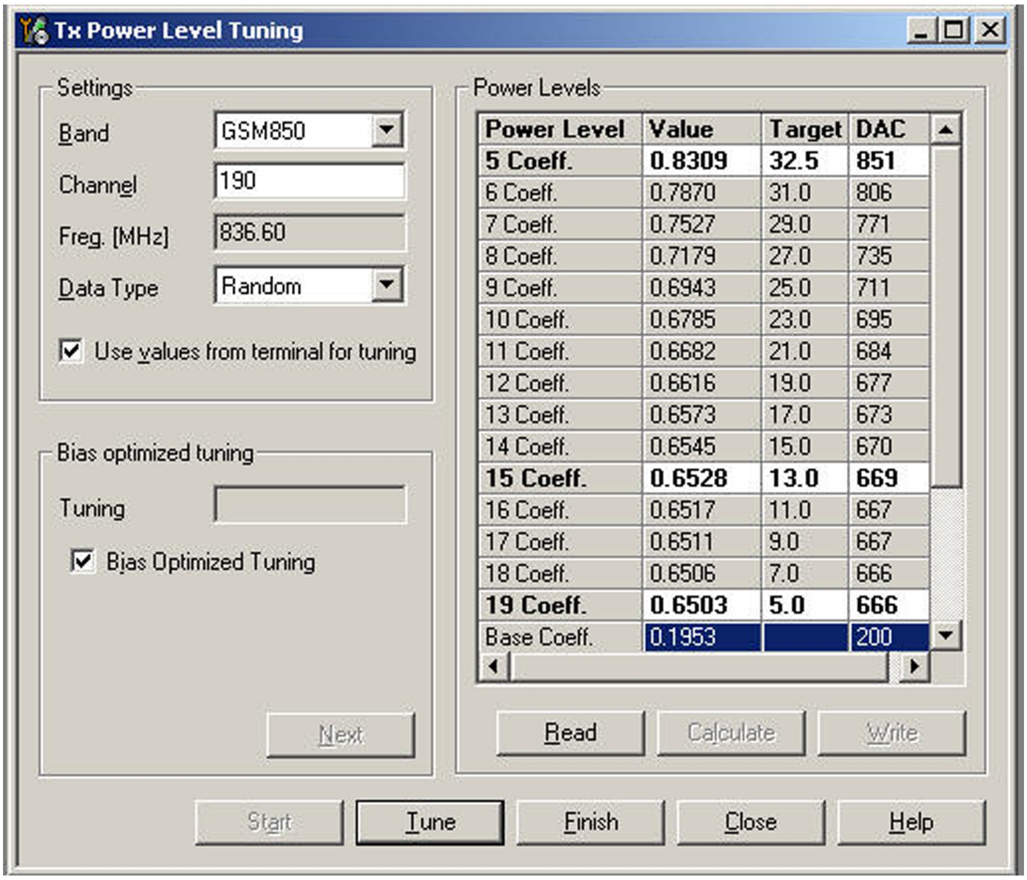
For EDGE transmission, the bias settings of the GSM PA are adjusted in order to improve linearity. This affects the PA gain and hence the power levels have to be aligned separately for EDGE transmission.

Tx power level tuning has to be performed on all GSM bands.

Steps

1. Connect the phone to a spectrum analyzer.
2. Start *Phoenix* service software.
3. From the **Operating mode** drop-down menu, set mode to **Local**.
4. Choose **Tuning→GSM→Tx Power Level Tuning** .

5. Click **Start**.l


Tx Power Level Tuning
Settings
Power Levels
Bias optimized tuning
Next
Read
Calculate
Write
Start
Tune
Finish
Close
Help

Band: GSM850
Channel: 190
Freq. [MHz]: 836.60
Data Type: Random

☑ Use values from terminal for tuning

Tuning:

☑ Bias Optimized Tuning

Power Level	Value	Target	DAC
5 Coeff.	**0.8309**	**32.5**	**851**
6 Coeff.	0.7870	31.0	806
7 Coeff.	0.7527	29.0	771
8 Coeff.	0.7179	27.0	735
9 Coeff.	0.6943	25.0	711
10 Coeff.	0.6785	23.0	695
11 Coeff.	0.6682	21.0	684
12 Coeff.	0.6616	19.0	677
13 Coeff.	0.6573	17.0	673
14 Coeff.	0.6545	15.0	670
15 Coeff.	**0.6528**	**13.0**	**669**
16 Coeff.	0.6517	11.0	667
17 Coeff.	0.6511	9.0	667
18 Coeff.	0.6506	7.0	666
19 Coeff.	**0.6503**	**5.0**	**666**
Base Coeff.	0.1953		200

6. Set the spectrum analyzer for power level tuning:

Frequency	Channel frequency: • **836.6 MHz GSM850** • **897.4MHz GSM900** • **1747.8MHz GSM1800** • **1880MHz GSM1900**
Span	0 Hz
Sweep time	2ms
Trigger	Video triggering (-10dBm)
Resolution BW	3MHz
Video BW	3MHz
Reference level offset	sum cable attenuation with module jig attenuation
Reference level	33dBm

A power meter with a peak power detector can be also used. Remember to take the attenuations into account.

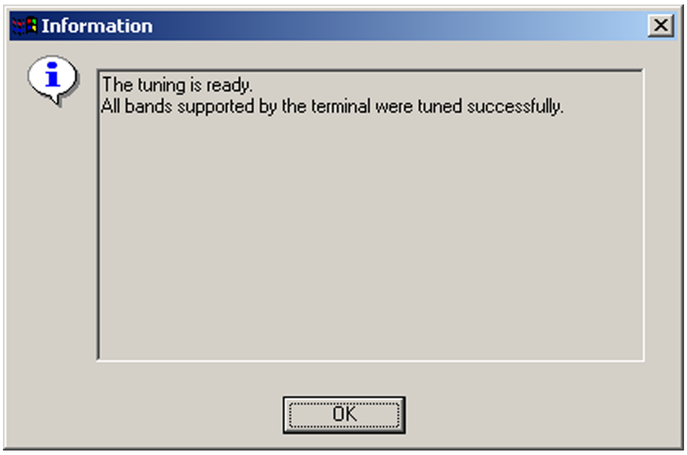
7. Set the tuning targets according to the values in the table below

GMSK	1Slot	2 slot	3 slot
850	32,5	32,5	31,2
900	32,5	32,5	31,2
1800	30	30	28,2
1900	30	30	28,2
EDGE	1Slot	2 slot	3 slot
850	26,5	26,5	24,7
900	26,5	26,5	24,7
1800	25	25	23,2
1900	25	25	23,2
WCDMA Band I	23.5 dBm		
WCDMA Band V	24 dBm		

8. Adjust power for all bold power levels to correspond the **Target dBm** column by pressing **+** or **–** keys.
9. If all bold power levels are adjusted, click **Next** to continue with **GSM850 EDGE**.
10. Adjust power for all bold power levels to correspond the **Target dBm** column by pressing **+** or **–** keys.

Next actions

Continue tuning the bold power levels of the GSM900, GSM1800 and GSM1900 bands. You will see this message, if finished successfully:



The tuning is ready.
All bands supported by the terminal were tuned successfully.

WCDMA receiver tunings

RX calibration (WCDMA)

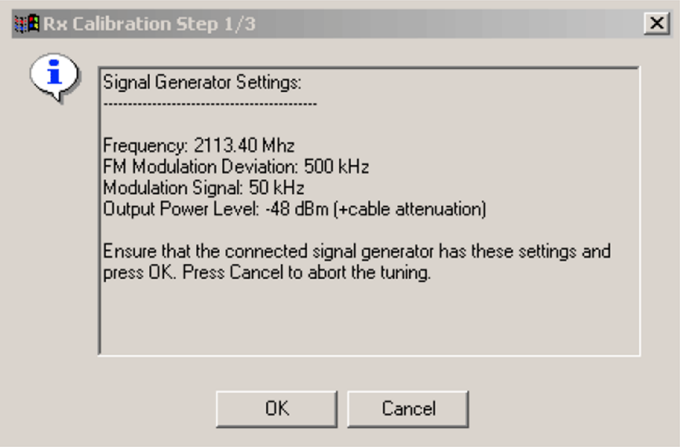
Context

Rx calibration tuning routine calculates the real gain values of the WCDMA Rx AGC system. There is also a SAW filter between front end LNA and mixer in the receive chain, which causes ripple in the RSSI measurement, this is calibrated out. The SAW filter is intergated into RF ASIC N7500.

Rx calibration can be done in two different ways, manual tune and sweep mode tune. If the signal generator in use supports frequency sweep table, the calibration is done in one step.

Steps

1. For manual tuning, set mode to **Local** in the **Operating Mode** dropdown menu.
2. In the **Tuning** menu, choose **WCDMA→Rx Calibration** .
3. Click **Start**.
4. Select Band "WCDMA2100 or WCDMA850".
5. Click **Tune**.
6. Setup the signal generator to correspond with the values on the, *Rx Calibration* pop-up window and click **OK**.



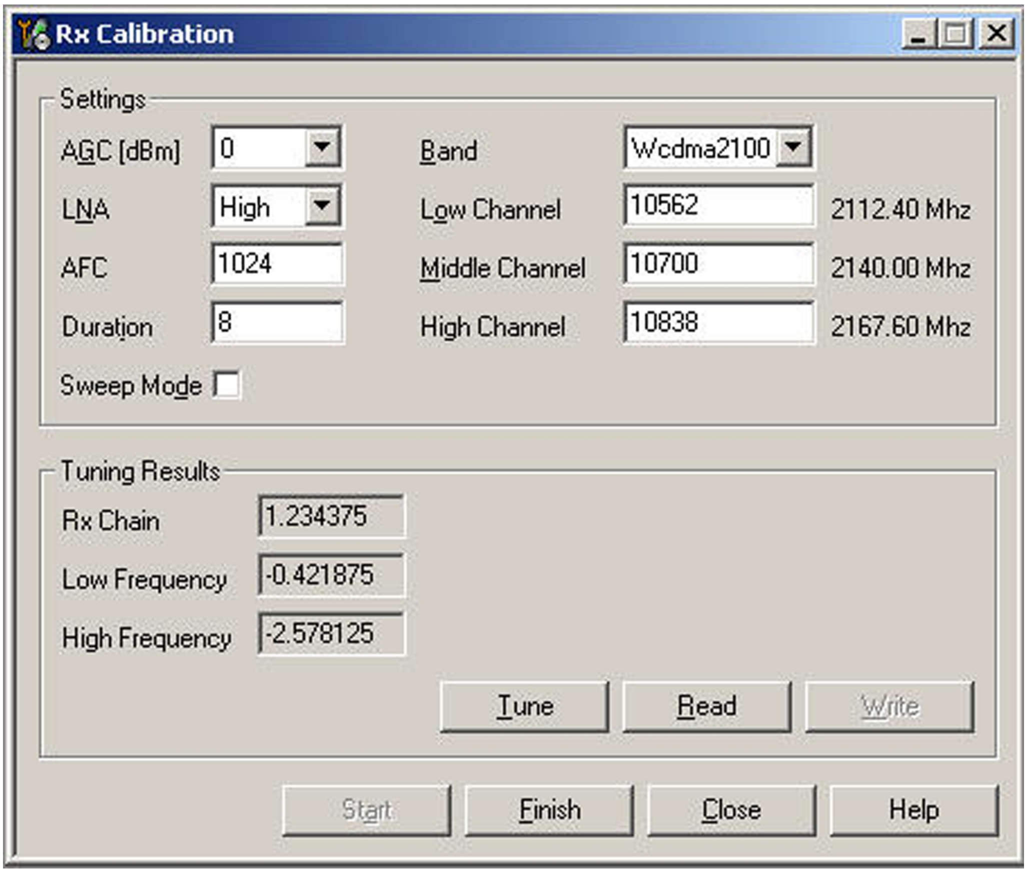
Signal Generator Settings:

Frequency: 2113.40 Mhz
FM Modulation Deviation: 500 kHz
Modulation Signal: 50 kHz
Output Power Level: -48 dBm (+cable attenuation)

Ensure that the connected signal generator has these settings and press OK. Press Cancel to abort the tuning.

Figure 26 Pop-up window for WCDMA2100

7. Repeat step 6. for Middle and High channels.



AGC [dBm]: 0
LNA: High
AFC: 1024
Duration: 8
Sweep Mode ☐
Band: Wcdma2100
Low Channel: 10562 2112.40 Mhz
Middle Channel: 10700 2140.00 Mhz
High Channel: 10838 2167.60 Mhz

Rx Chain: 1.234375
Low Frequency: -0.421875
High Frequency: -2.578125

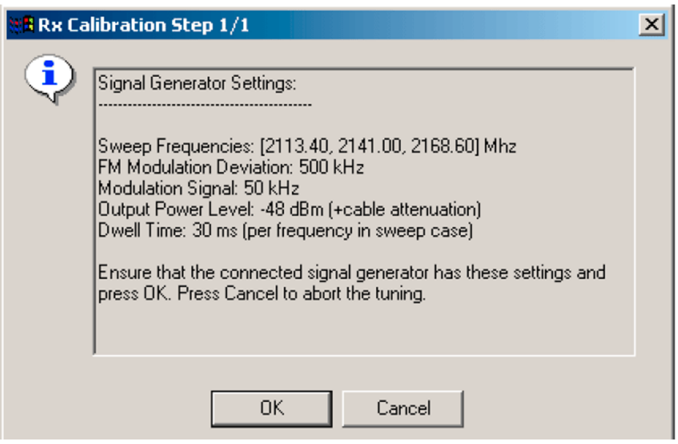
8. Ensure Tuning Results are within limits specified in the table below:
   If values are OK, click **Write** to save the values.

	Band	Min	Typ	Max	Unit
Rx chain	2100 or 850	-6	1.5 to 3.5	6	dB
Low Frequency		-5	-0.7 to 4.0	5	
High Frequency		-5	-0.7 to 4.0	5	

Alternative steps

- For sweep mode tuning, set **Mode** to **Local** in the **Operating Mode** dropdown menu.
- In the **Tuning** menu, choose **WCDMA**→ **Rx Calibration** .
- Click **Start**.
- Select **Band**, "WCDMA2100 or WCDMA850".
- Check the **Sweep Mode** box.
- Click **Tune**.

- Setup the signal generator to correspond with the values on the *Rx Calibration* pop-up window and click **OK**.



Signal Generator Settings:

Sweep Frequencies: [2113.40, 2141.00, 2168.60] Mhz
FM Modulation Deviation: 500 kHz
Modulation Signal: 50 kHz
Output Power Level: -48 dBm (+cable attenuation)
Dwell Time: 30 ms (per frequency in sweep case)

Ensure that the connected signal generator has these settings and press OK. Press Cancel to abort the tuning.

Figure 27 Pop-up window for WCDMA2100

- Ensure Tuning Results are within limits specified in the table above: If values are OK, click **Write** to save the values to the phone.
- Close the tuning window.

WCDMA transmitter tunings

Tx AGC & power detector (WCDMA)

Context

Tx AGC & power detector tuning has two purposes:

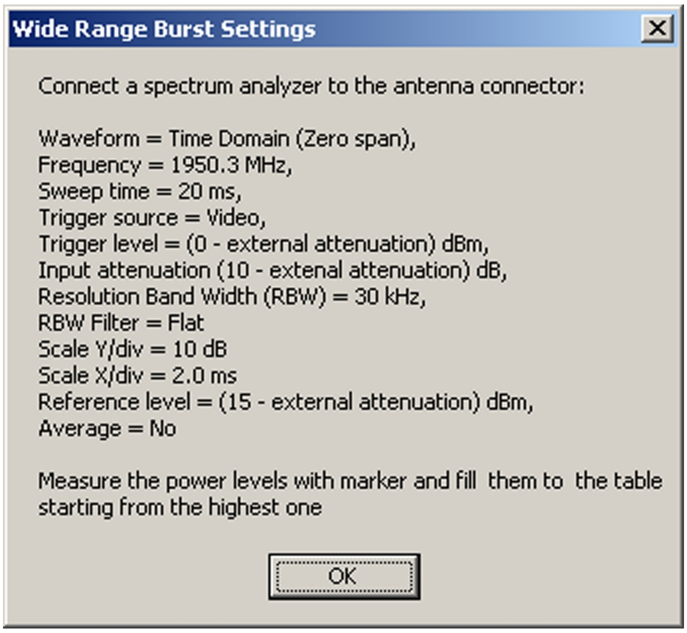
- to enable the phone to select the correct TxC value accurately in order to produce the required RF level
- to enable the phone to measure its own transmitter power accurately

There are two ways to perform the tuning. For an alternative method, see Alternative steps (page 4–49).

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning→WCDMA→Tx AGC & Power Detector.**
3. Click **Start**.
4. In the *Wide Range* pane, click **Tune** (the leftmost **Tune** button).

5. Set up the spectrum analyzer in the following way:



Connect a spectrum analyzer to the antenna connector:

Waveform = Time Domain (Zero span),
Frequency = 1950.3 MHz,
Sweep time = 20 ms,
Trigger source = Video,
Trigger level = (0 - external attenuation) dBm,
Input attenuation (10 - extenal attenuation) dB,
Resolution Band Width (RBW) = 30 kHz,
RBW Filter = Flat
Scale Y/div = 10 dB
Scale X/div = 2.0 ms
Reference level = (15 - external attenuation) dBm,
Average = No

Measure the power levels with marker and fill them to the table starting from the highest one

6. After setting the spectrum analyzer, click **OK**.
7. Measure the power levels with a marker.

   Take the first measurement from 250 us after the trigger, the second after 750 us, the third after 1250 us and so on for every 500 us until the table is filled.

   > **Note:** It must be possible to measure power levels down to –68 dBm. The measured power levels must be monotonously decreasing.
   >
   > Make sure that the marker is not measuring the level of noise spikes on lower levels.

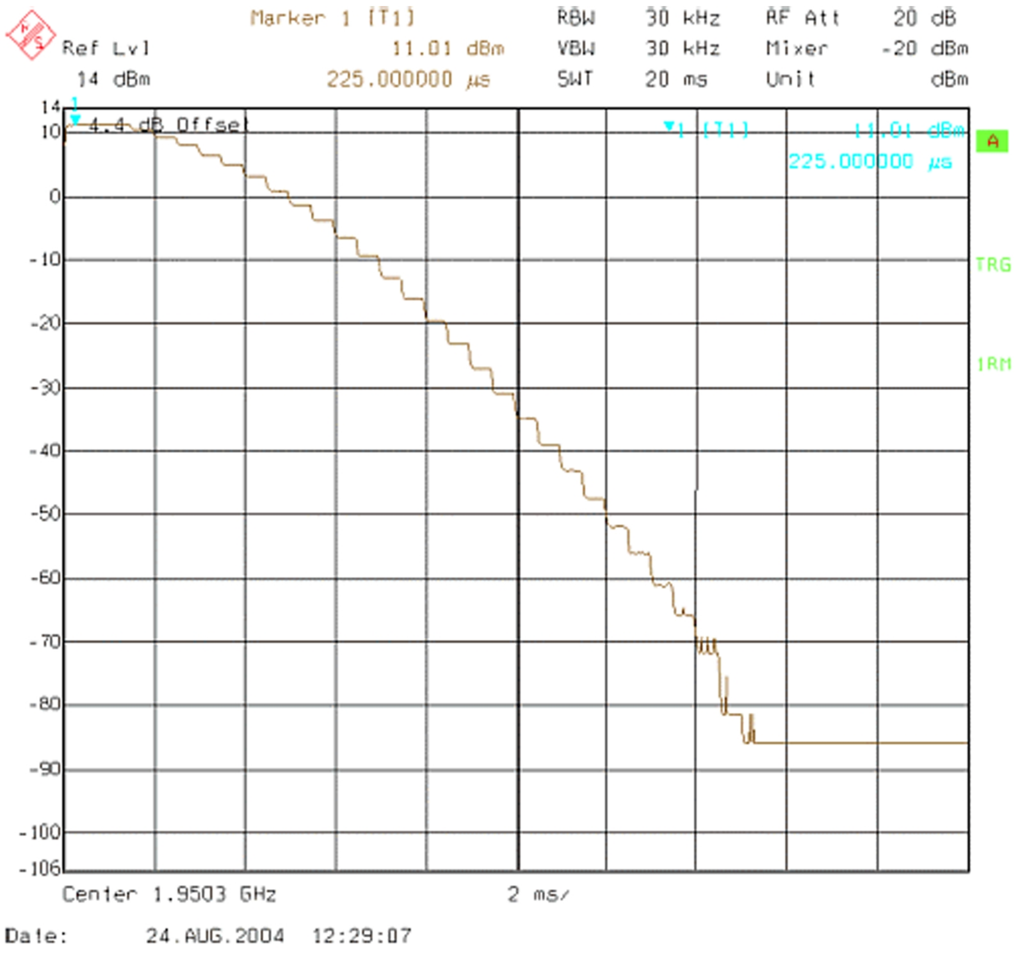
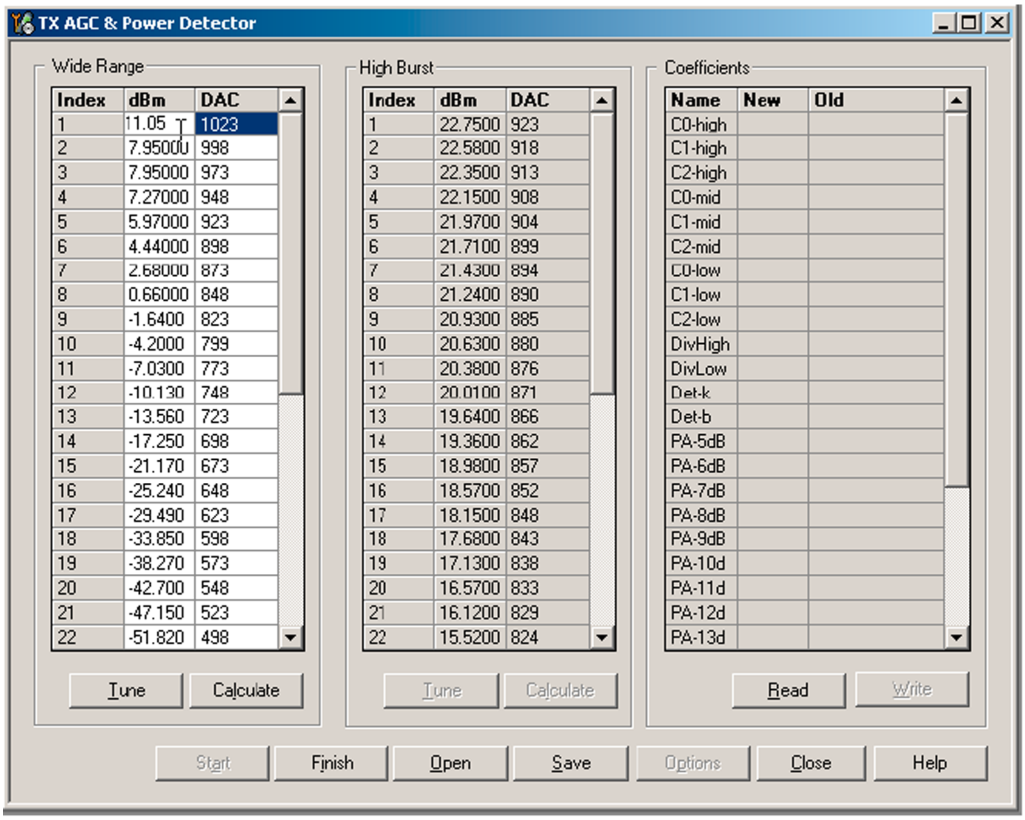


Figure 28 WCDMA power level tuning steps

8. Fill in the power level values (in dBm) to the *Wide Range* table.



Wide Range

Index	dBm	DAC
1	11.05	1023
2	7.95000	998
3	7.95000	973
4	7.27000	948
5	5.97000	923
6	4.44000	898
7	2.68000	873
8	0.66000	848
9	-1.6400	823
10	-4.2000	799
11	-7.0300	773
12	-10.130	748
13	-13.560	723
14	-17.250	698
15	-21.170	673
16	-25.240	648
17	-29.490	623
18	-33.850	598
19	-38.270	573
20	-42.700	548
21	-47.150	523
22	-51.820	498

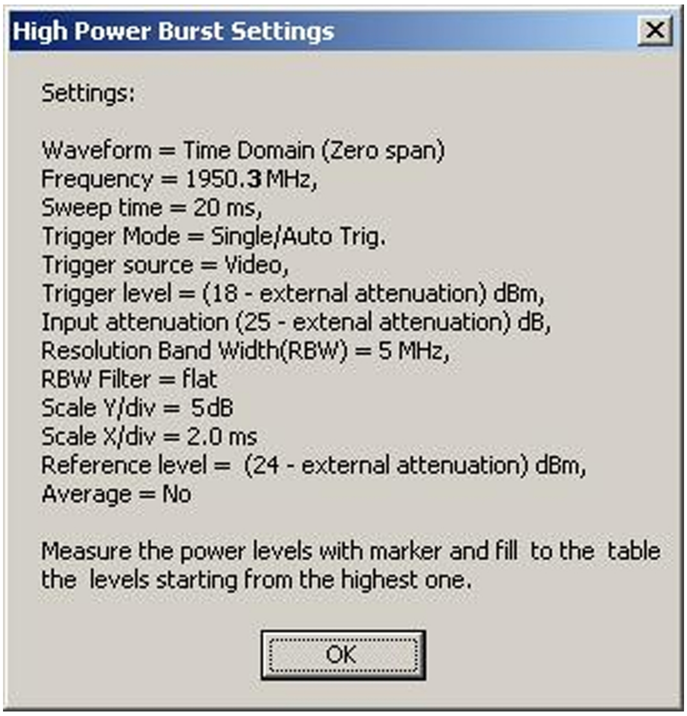
High Burst

Index	dBm	DAC
1	22.7500	923
2	22.5800	918
3	22.3500	913
4	22.1500	908
5	21.9700	904
6	21.7100	899
7	21.4300	894
8	21.2400	890
9	20.9300	885
10	20.6300	880
11	20.3800	876
12	20.0100	871
13	19.6400	866
14	19.3600	862
15	18.9800	857
16	18.5700	852
17	18.1500	848
18	17.6800	843
19	17.1300	838
20	16.5700	833
21	16.1200	829
22	15.5200	824

Coefficients

Name	New	Old
C0-high		
C1-high		
C2-high		
C0-mid		
C1-mid		
C2-mid		
C0-low		
C1-low		
C2-low		
DivHigh		
DivLow		
Det-k		
Det-b		
PA-5dB		
PA-6dB		
PA-7dB		
PA-8dB		
PA-9dB		
PA-10d		
PA-11d		
PA-12d		
PA-13d		

9. In the *Wide Range* pane, click **Calculate**.
10. In the *High Burst* pane, click **Tune**.
11. Adjust the spectrum analyzer according to the following settings:



Settings:

Waveform = Time Domain (Zero span)
Frequency = 1950.3 MHz,
Sweep time = 20 ms,
Trigger Mode = Single/Auto Trig.
Trigger source = Video,
Trigger level = (18 - external attenuation) dBm,
Input attenuation (25 - extenal attenuation) dB,
Resolution Band Width(RBW) = 5 MHz,
RBW Filter = flat
Scale Y/div = 5dB
Scale X/div = 2.0 ms
Reference level = (24 - external attenuation) dBm,
Average = No

Measure the power levels with marker and fill to the table the levels starting from the highest one.

12. Measure the power levels with a marker.

    Take the first measurement from 250 us after the trigger, the second after 750 us, the third after 1220 us and so on for every 500 us until the table is filled.

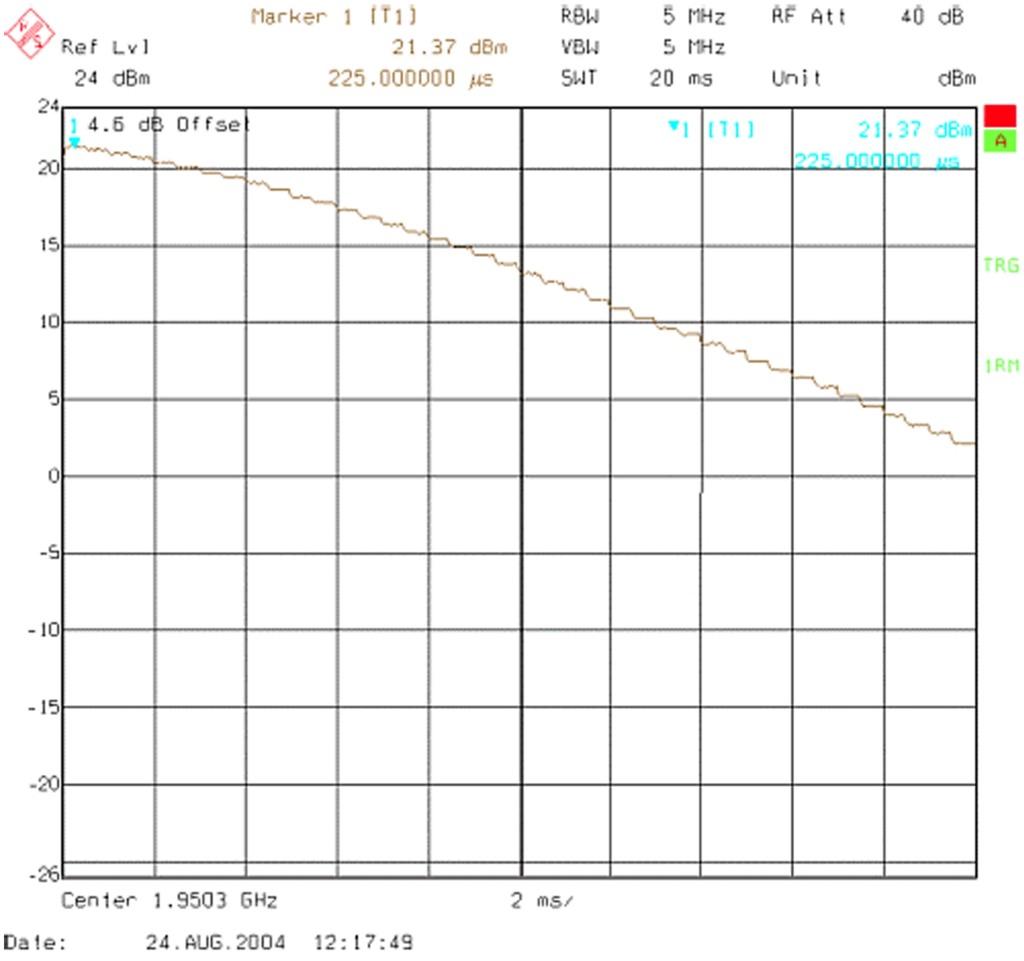


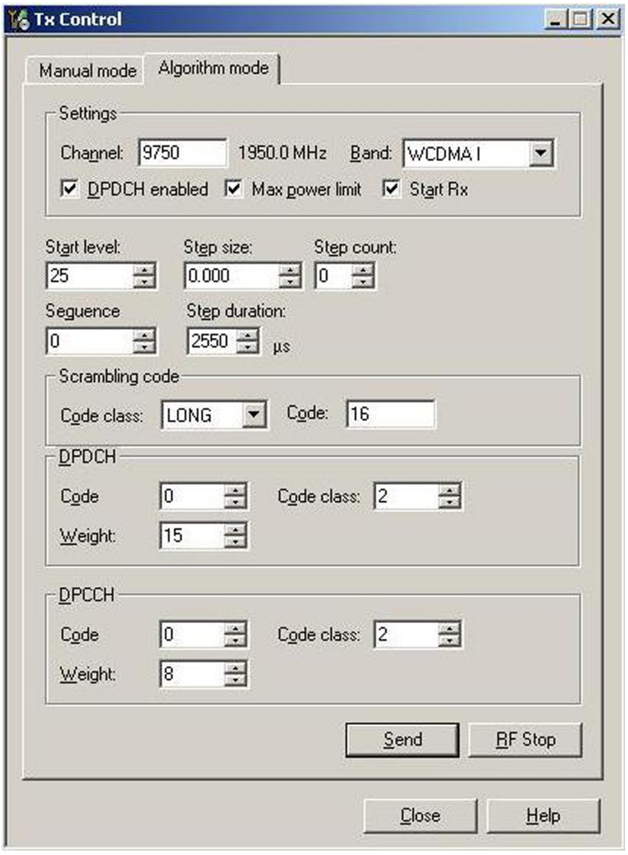
Figure 29 High burst measurement

13. In the *High Burst* pane, click **Calculate**.
14. Check that the calculated values are within the limits specified in the following table:

	Min	Max
C0-high	-0.5	5
C1-high	-50	50
C2-high	400	900
C0-mid	-0.7	0.7
C1-mid	0	50
C2-mid	400	900
C0-low	-4	4
C1-low	-400	440
C2-low	-10000	15000

	Min	Max
Det-k	100	220
Det-b	0	150

15. To save the coefficients to the phone, click **Write**.
16. To close the *Tx AGC & Power Detector* window, click **Close**.
17. Choose **Testing→WCDMA→ Tx Control.**
18. Select the *Algorithm* mode tab.



Settings
Channel: 9750 1950.0 MHz Band: WCDMA I
☑ DPDCH enabled ☑ Max power limit ☑ Start Rx

Start level: 25
Step size: 0.000
Step count: 0
Sequence: 0
Step duration: 2550 µs

Scrambling code
Code class: LONG
Code: 16

DPDCH
Code: 0
Code class: 2
Weight: 15

DPCCH
Code: 0
Code class: 2
Weight: 8

19. Write the target power level 25 dBm to the *Start level* line and check the **Max power limit** check box (detector calibration check).
20. Setup the spectrum analyzer with the following settings:

Center frequency:	**1950.3 MHz (WCDMA I)** or **836.9 (WCDMA V)**
Span:	0 Hz
Reference level offset:	Cable attenuations + adapter attenuation
Reference level:	**24 dBm or -20 dBm depending on the level measured**
Input attenuation:	Automatic
Resolution bandwidth:	5 MHz
Video bandwidth:	5 MHz
Sweep time:	20 ms

Detector:	**RMS detector**
Average:	No
Trigger:	Free run

21. Click **Send**.
22. Measure the WCDMA output power.

    It should be around 21 dBm.
23. Click **RF Stop** and uncheck the **Max power limit** check box.
24. Repeat steps **19** to **23** for levels +19, +7, 0, -20 and –40 dBm.

    The measured output power may not differ more than +-2 dB from the requested value at level +19 dBm and no more than +-4 dB on lower levels.

    Remember to stop the RF before sending new data.

Alternative steps

- Measure the wide range levels normally and write down the levels that are possible to measure.
- Click **Finish**.
- Click **Options**.
- Change the first wide range DAC value to 573 and change the number of tuning steps to 21.
- Change the spectrum analyzer reference level to –20 dBm and adjust the input attenuator to the lowest value possible.
- In the *Wide Range* pane, click **Tune** and fill in the rest of values starting from the 19th level.

Tx band response calibration (WCDMA)

Context

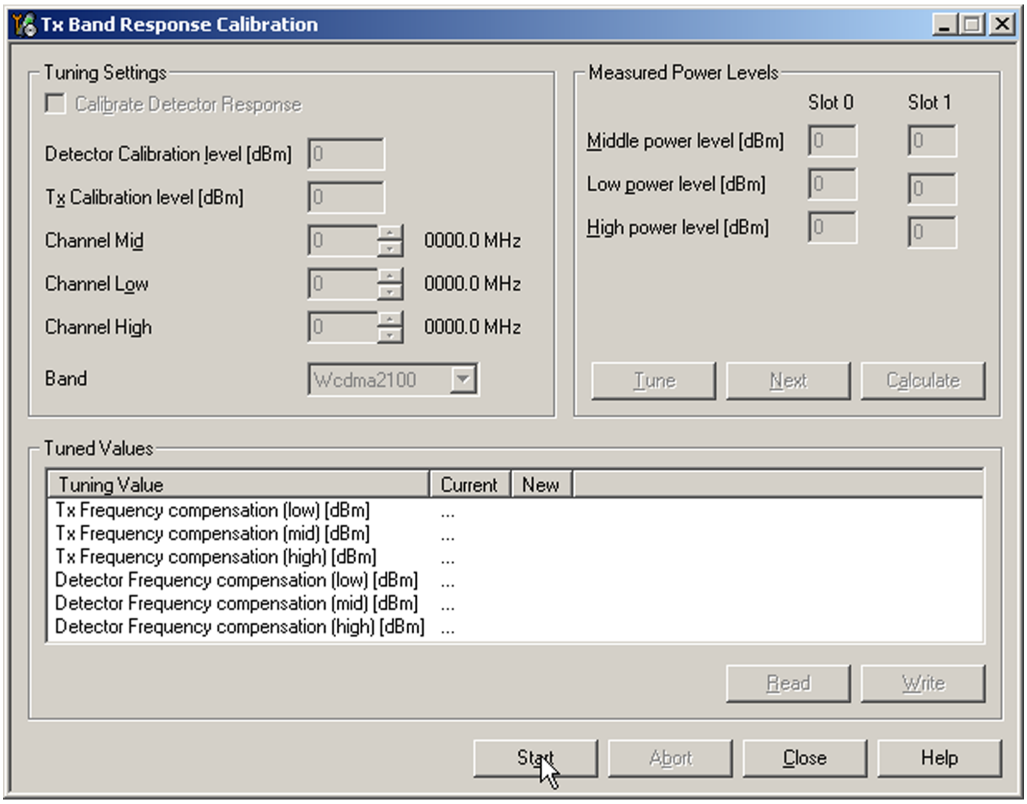
The purpose of this tuning operation is to calibrate the WCDMA Tx performance. It defines the power detector and Tx frequency compensation values. However, before starting this tuning procedure, it is necessary to carry out Tx AGC & Power Detector Calibration tuning. This is because its results will be needed for this tuning operation.

- In the *Tuning Settings* pane, it is possible to edit the numbers of channels used in this tuning operation.
- If the **Calibrate Detector Response** check box is checked, only Tx response is calibrated. Zero is written to the power detector compensation values block in the permanent memory (PM) of the terminal.
- **Detector Calibration level** shows the power level used for calibrating the power detector in this tuning procedure.
- **Tx Calibration level** shows the power level used for calibrating tx frequency in this tuning procedure.
- In the *Measured Power Levels* pane, you can insert the dBm values read from the power meter.
- In the *Tuned Values* pane, the values that are stored in the permanent memory (PM) of the terminal in Current columns are shown.
- New values are added to *New* column when the **Calculate** button is clicked.
- The **Abort** button aborts the tuning operation without saving the tuned values.
- The **Read** button reads the tuned values in the PM of the terminal, and displays them in the *Tuned Values* pane in in the *Current* column.

Steps

1. Start *Phoenix* service software.

2. Choose **File→Scan Product** .
3. From the **Operating mode** drop-down menu, set mode to **Local**.
4. Choose **Tuning→WCDMA→Tx Band Response Calibration** .
5. Click **Start**.



Detector Calibration level [dBm] 0
Tx Calibration level [dBm] 0
Channel Mid 0 0000.0 MHz
Channel Low 0 0000.0 MHz
Channel High 0 0000.0 MHz
Band Wcdma2100

	Slot 0	Slot 1
Middle power level [dBm]	0	0
Low power level [dBm]	0	0
High power level [dBm]	0	0

Tuning Value	Current	New
Tx Frequency compensation (low) [dBm]	...	
Tx Frequency compensation (mid) [dBm]	...	
Tx Frequency compensation (high) [dBm]	...	
Detector Frequency compensation (low) [dBm]	...	
Detector Frequency compensation (mid) [dBm]	...	
Detector Frequency compensation (high) [dBm]	...	

The current values are shown in the *Tuned Values* pane.

6. Click **Tune**.
7. Connect the power meter to the terminal, and set it to **Channel Mid** frequency.
8. Read the values of slot 0 and slot 1 from the power meter and enter them to **Middle power level** fields in the **Measured Power Levels** pane.

   Slot 0 is used for detector calibration and slot 1 for Tx calibration.
9. Click **Next**.
10. Switch the power meter to **Channel Low** frequency.
11. Read the values from the power meter, and enter them to **Low power level** fields.
12. Switch the power meter to **Channel High** frequency.
13. Read the values from the power meter, and enter them to **High power level** fields.
14. Click **Next**.
15. Click **Calculate**.

   The tuned values are shown in the *Tuned Values* pane in the *New* column.
16. Check that the tuned values are within the limits presented in the following table. If they are OK, click **Yes**.

	Min	Max
Tx Freq Comp (the first and last value)	-4	+4

17. To save the tuned values to the terminal, click **Write**.
18. Close the *Tx Band Response Calibration* window.

Tx LO leakage (WCDMA)

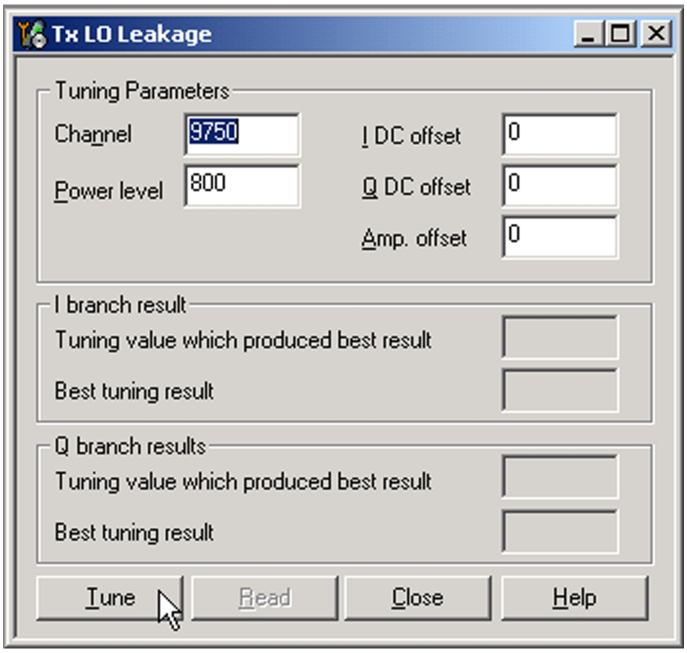
Context

The purpose of Tx LO leakage tuning is to minimize the carrier leakage of the IQ-modulator which is caused by the DC offset voltages in the Tx IQ-signal lines and in the actual IQ modulator.

The tuning improves WCDMA Tx AGC dynamics at low power levels. A self-calibration routine selects the best combination for internal control words in order to produce minimum LO leakage.

Steps

1. From the **Operating mode** drop-down menu, set mode to **Local**.
2. Choose **Tuning**→**WCDMA**→ **Tx LO Leakage** .
3. Click **Tune**.



Channel 9750
Power level 800
I DC offset 0
Q DC offset 0
Amp. offset 0

Tx LO Leakage
Tuning Parameters
I branch result
Tuning value which produced best result
Best tuning result
Q branch results
Tuning value which produced best result
Best tuning result
Tune
Read
Close
Help

4. To end the tuning, click **Close**.

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5 — System Module

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Introduction

Phone description

RAP3G is the main digital baseband ASIC in the phone. It contains functionality for both WCDMA and GSM EDGE. Julie (Hardware accelerator) is used as a co-processor.

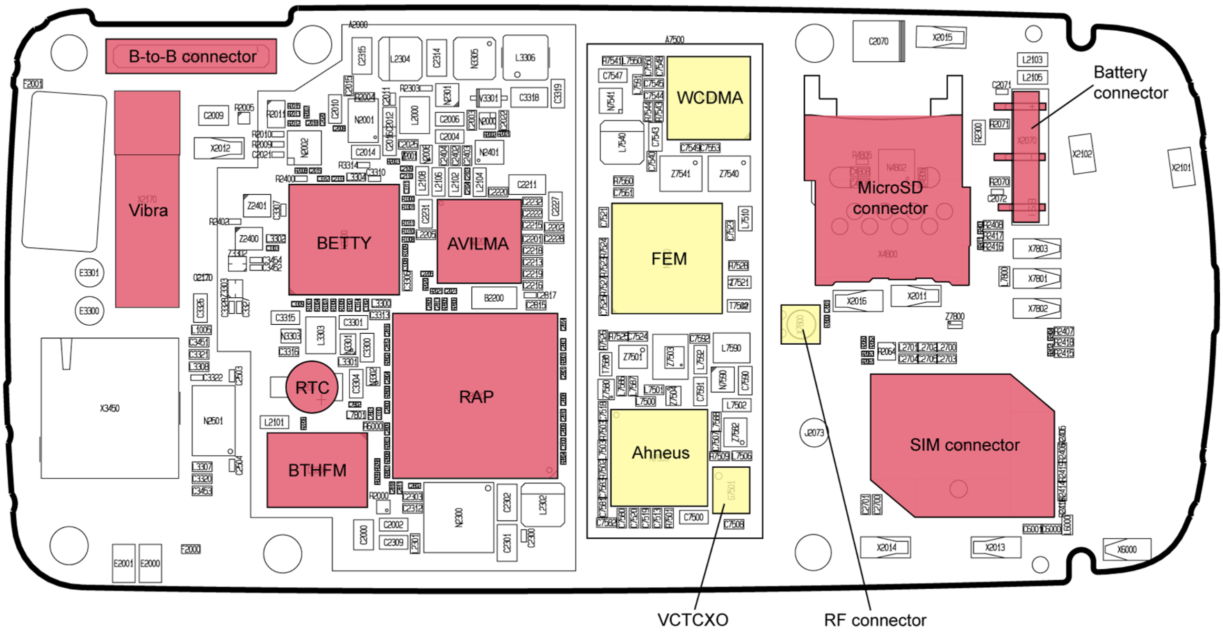
N2200 (AVILMA) is mainly the audio ASIC in the phone and N2300 (BETTY) is basically the energy management controller for the phone.

Key components

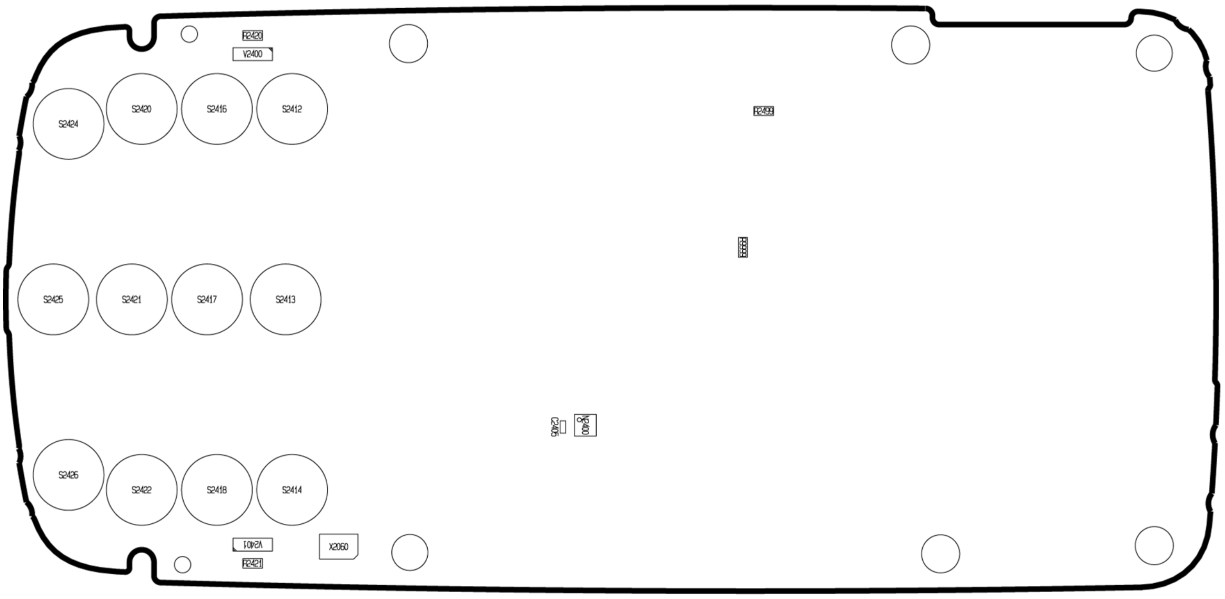
Function	Description	Item ref
Main board	2fka	
Flash board	2fkb	
Top flex	2fkc	
Camera flex	2fkd	
Baseband ASIC	AVILMA BETTY	N2200 N2300
RF ASIC	Ahneus	N7505
Processor	RAP3G	D2800
Co-processor	Julie hardware accelerator (camera)	N3300
PA GSM	Front end module (FEM), quad band	N7520
PA WCDMA		N7540
Oscillators	VCTCXO Balun GSM Balum WCDMA	G7501 T7502 T7580
Memories	512 Mbit NOR + 128 Mbit SDRAM Combo (Stacked with RAP3G) SDRAM 64 MB	D3000
Back-up battery	RTC back-up battery 311	G2200
Bluetooth	BTHFM2.1 module	D6000
Accelerometer	Tap commands	N2501
Slide switch	Hall IC switch/position sensor	N2550
Battery	BL-4U	
Battery connector	Tabby blade interface	X2070
MicroSD connector		X4800
MicroUSB connector		X2001
BTB connector	Coax board-to-board connector	X3300
RF connector		X7800

Key component placement

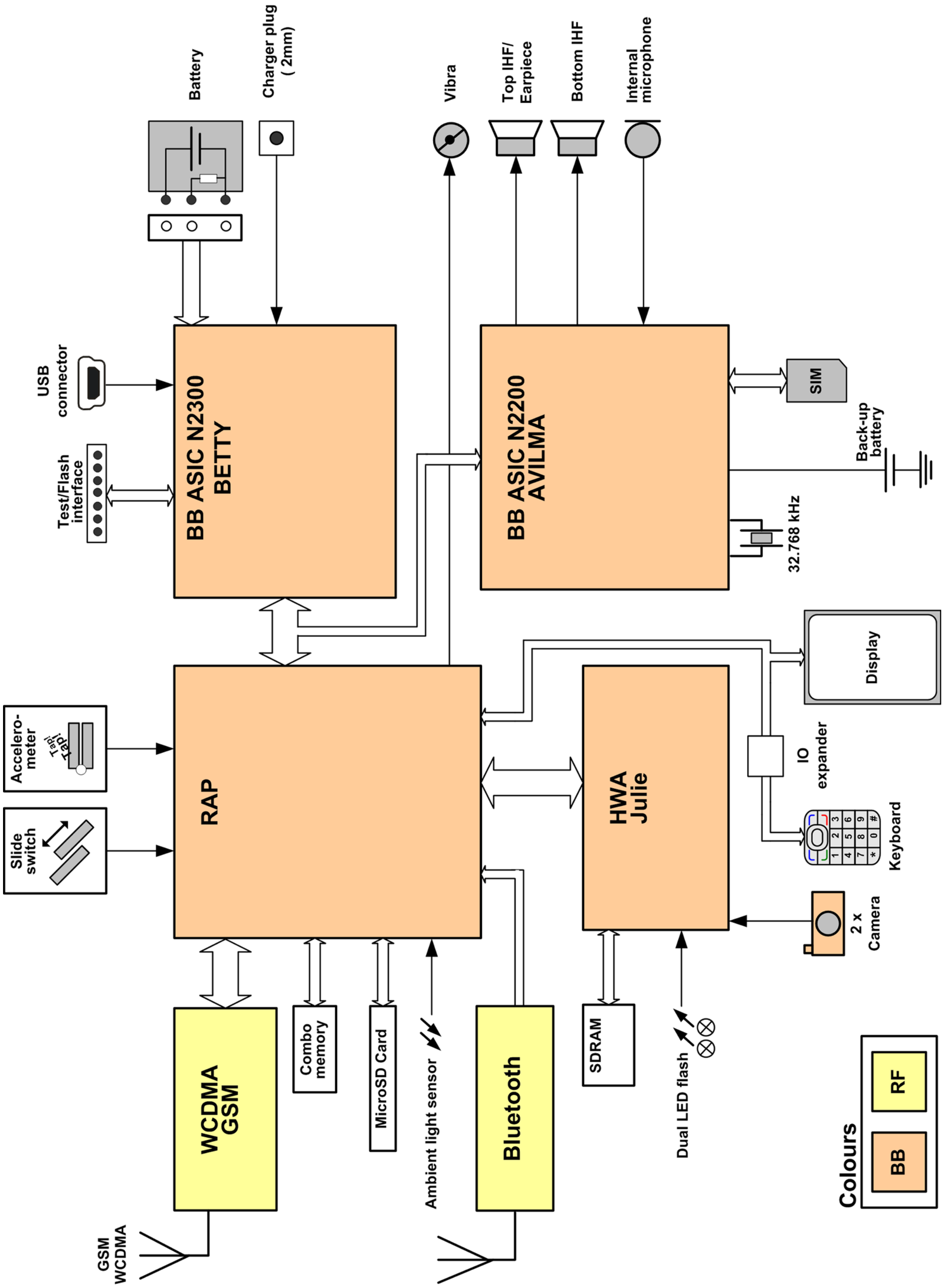
Top side


B-to-B connector
Vibra
BETTY
AVILMA
RTC
RAP
BTHFM
WCDMA
FEM
Ahneus
MicroSD connector
Battery connector
SIM connector
VCTCXO
RF connector
A2000
A7500
X3450
N2501
X2015
X2101
X2102
X2016
X2011
X2014
X2013
X6000
J2073
E3301
E3300
F2001
E2001
E2000
F2000

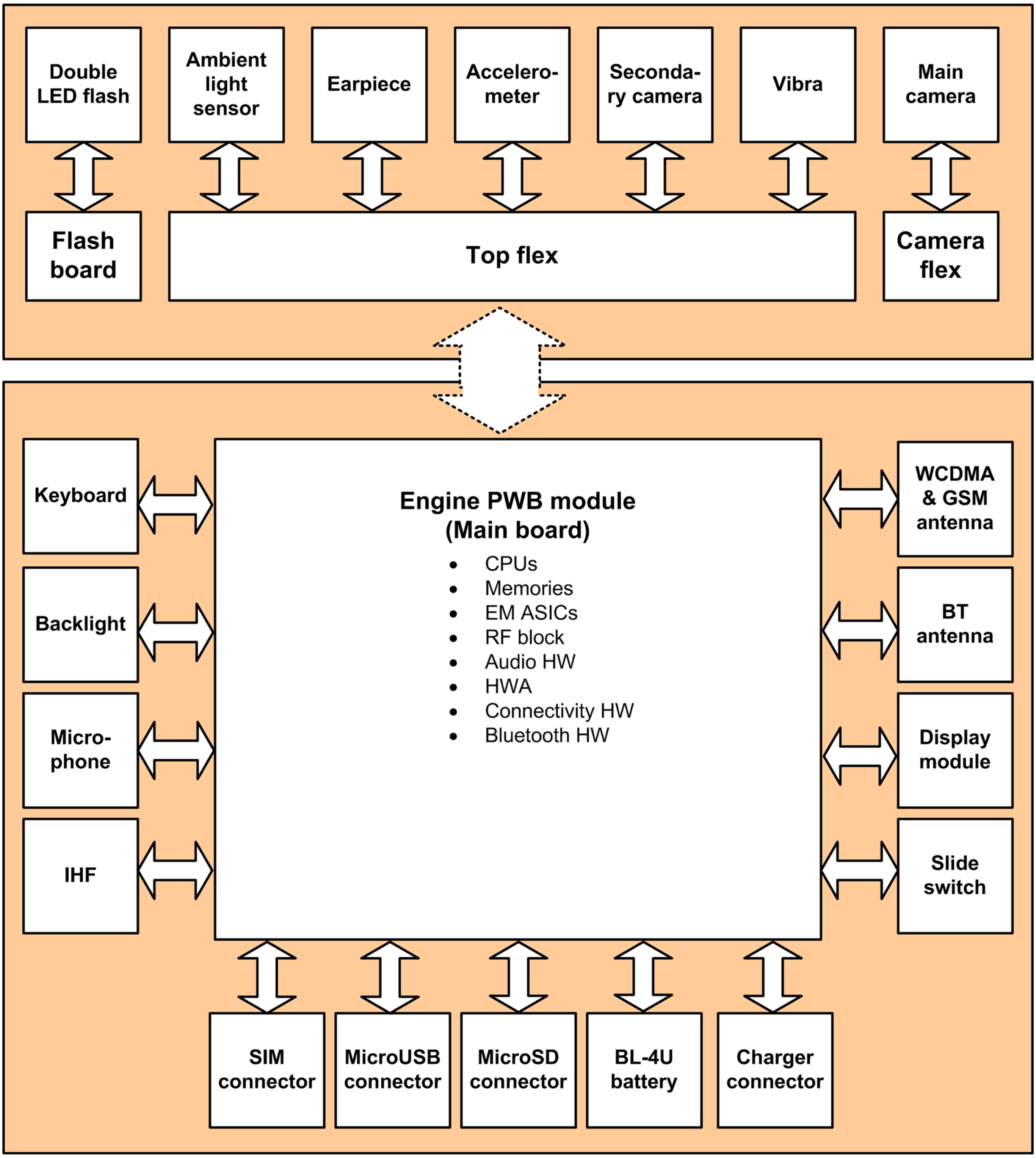
Bottom side


R2420
V2400
S2424
S2420
S2416
S2412
S2425
S2421
S2417
S2413
S2426
S2422
S2418
S2414
V2401
R2421
X2060
R2499

System module block diagram


Battery
Charger plug (2mm)
Vibra
Top IHF/ Earpiece
Bottom IHF
Internal microphone
USB connector
Test/Flash interface
BB ASIC N2300 BETTY
BB ASIC N2200 AVILMA
SIM
Back-up battery
32.768 kHz
Display
IO expander
Keyboard
2 x Camera
Accelero-meter
Tap! Tap!
Slide switch
RAP
HWA Julie
WCDMA GSM
Combo memory
MicroSD Card
Ambient light sensor
Bluetooth
SDRAM
Dual LED flash
GSM WCDMA
Colours
BB
RF

Board and module connections


Double LED flash
Ambient light sensor
Earpiece
Accelero-meter
Seconda-ry camera
Vibra
Main camera
Flash board
Top flex
Camera flex
Keyboard
Backlight
Micro-phone
IHF
Engine PWB module (Main board)
CPUs
Memories
EM ASICs
RF block
Audio HW
HWA
Connectivity HW
Bluetooth HW
WCDMA & GSM antenna
BT antenna
Display module
Slide switch
SIM connector
MicroUSB connector
MicroSD connector
BL-4U battery
Charger connector

Energy management

Battery and charging

BL-4U

The phone is powered by a 3-pole BL-4U 1000 mAh battery. The three poles are named VBAT, BSI and GND where the BSI line is used to recognize the battery capacity. This is done by means of an internal battery pull down resistor.

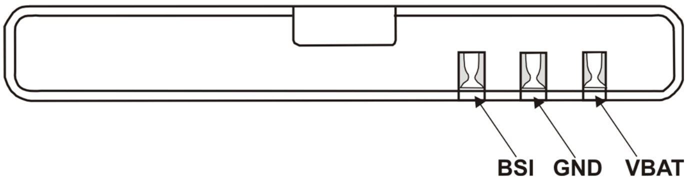


Figure 30 Battery pin order

The battery temperature is estimated by measuring separate battery temperature NTC via the BTEMP line. This is located on the main PWB, at the place where the phone temperature is closest to the battery temperature.

Battery connector

The battery connector is a blade connector. It has three blades;

- BSI (Battery size indicator)
- GND (Ground)
- VBAT (Battery voltage)

The BSI line is used to recognize the battery capacity by a battery internal pull down resistor.

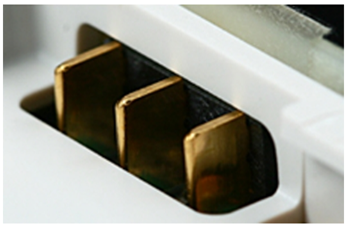


Figure 31 Blade battery connector

Charging

This phone is charged through the smaller Nokia standard interface (2.0 mm plug). The wider standard charger (3.5 mm) can be used together with the CA-44 charger adapter.

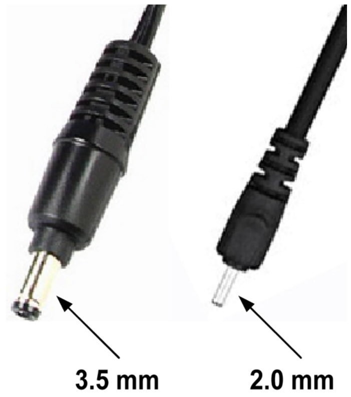


Figure 32 Small (right) and wide (left) charger plugs

The phone can also be charged through the micro USB interface.

Charging is controlled by energy management, and external components are needed to protect the baseband module against EMC, reverse polarity and transient frequency deviation.

Charging a dead battery

Charging of a dead battery has to be carried out via an approved NOKIA charger. Charging of a dead battery via a PC is not allowed since this procedure is not including a current regulator (the battery can be charged with a too high current level).

Normal and extreme voltages

Energy management is mainly carried out in the two Application Specific Integrated Circuits (ASICs) N2300 BETTY and N2200 AVILMA. These two circuits contains a number of regulators. In addition there are some external regulators too.

In the table below normal and extreme voltages are shown when a BL-4U battery-pack is used.

Table 13 Nominal voltages

Voltage	Voltage [V]	Condition
General Conditions		
Nominal voltage	3.700	
Lower extreme voltage	3.145	
Higher extreme voltage (fast charging)	4.230	
HW Shutdown Voltages		
Vmstr+	2.1 ± 0.1	Off to on
Vmstr-	1.9 ± 0.1	On to off
SW Shutdown Voltages		
Sw shutdown	3.1	In call
Sw shutdown	3.2	In idle
Min Operating Voltage		
Vcoff+	2.9 ± 0.1	Off to on
Vcoff-	2.6 ± 0.1	On to off

Power key and system power-up

When the battery is placed in the phone the power key circuits are energized. When the power key is pressed, the system boots up (if an adequate battery voltage is present).

Power down can be initiated by pressing the power key again (the system is powered down with the aid of SW). The power key is connected to EM ASIC N2200 (AVILMA) via PWRONX signal.

Modes of operation

Mode	Description
NO_SUPPLY	(dead) mode means that the main battery is not present or its voltage is too low (below N2200 AVILMA master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low but back-up battery voltage is adequate and the 32 kHz oscillator is running (RTC is on).
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over N2300 BETTY master reset threshold. All regulators are disabled, PurX is on low state, the RTC is on and the oscillator is on. PWR_OFF (cold) mode is almost the same as PWR_OFF (warm), but the RTC and the oscillator are off.
RESET	RESET mode is a synonym for start-up sequence. RESET mode uses 32 kHz clock to count the REST mode delay (typically 16ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the system's activity is low.
FLASHING	FLASHING mode is for SW downloading.

Clocking scheme

In BB5.0, two main clocks are provided to the system: 38.4MHz RF clock produced by VCTCXO in RF section and 32.768kHz sleep clock produced by EM ASIC N2200 with an external crystal.

32 k Sleep Clock is always powered on after startup. Sleep clock is used by RAP for low-power operation.

SMPS Clk is 2.4 MHz clock line from RAP to EM ASIC N2300. In deep sleep mode, when VCTCXO is off, this signal is set to '0'-state.

BT Clk is 38.4 MHz signal from Ahneus ASIC to BT module.

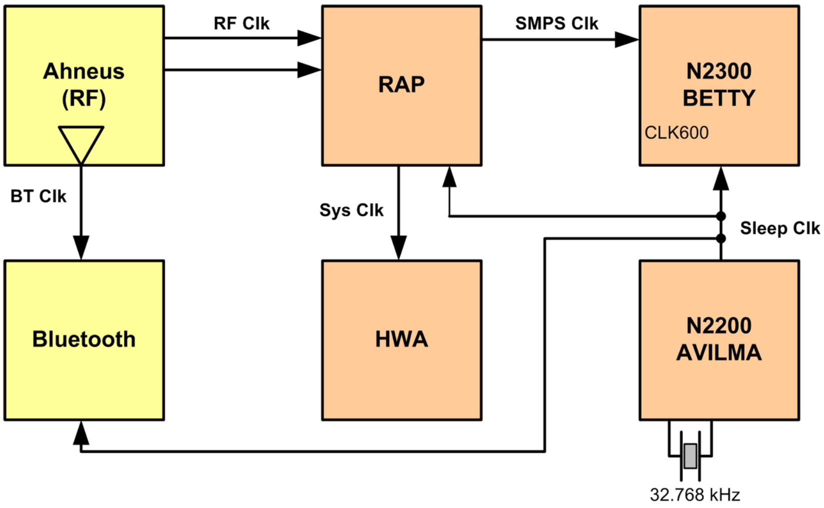


Figure 33 Clocking scheme

USB, SIM, microSD

USB

USB (Universal Serial Bus) provides a wired connectivity between a PC and peripheral devices. It is a differential serial bus.

USB 2.0 is supported with full speed (12 Mbps).

This phone is provided with a specific connector for MicroUSB.

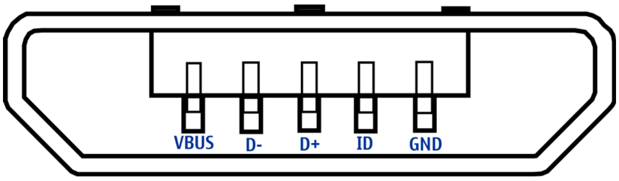

VBUS
D-
D+
ID
GND

Figure 34 MicroUSB Connector

SIM interface

The device has one SIM (Subscriber Identification Module) interface. It is only accessible if battery is removed. The SIM interface consists of an internal interface between RAP and EM ASIC (N2200), and of an external interface between N2200 and SIM contacts.

The SIM IF is shown in the following figure:

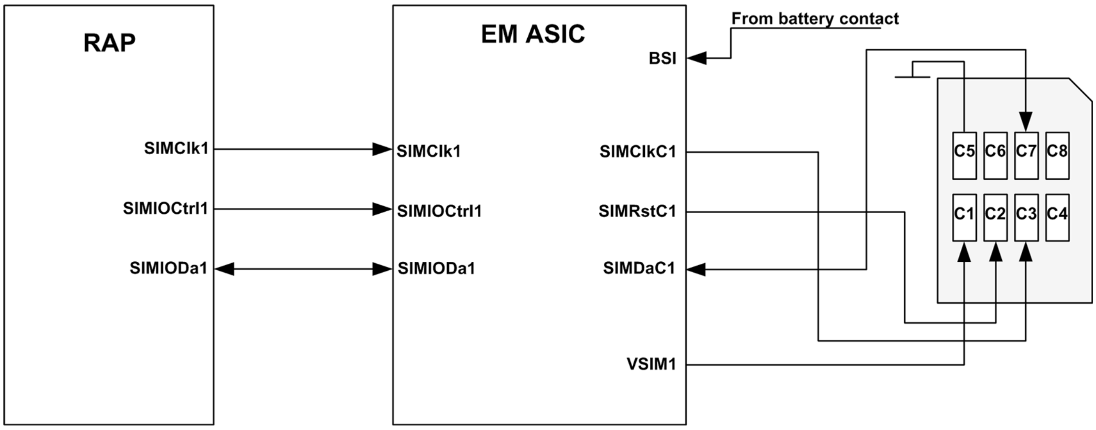

RAP
SIMClk1
SIMIOCtrl1
SIMIODa1
EM ASIC
SIMClk1
SIMIOCtrl1
SIMIODa1
BSI
SIMClkC1
SIMRstC1
SIMDaC1
VSIM1
From battery contact
C5
C6
C7
C8
C1
C2
C3
C4

Figure 35 SIM interface

The EM ASIC handles the detection of the SIM card. The detection method is based in the BSI line. Because of the location of the SIM card, removing the battery causes a quick power down of the SIM IF.

The SIM interface supports both 1.8 V and 3.0 V SIM cards. The SIM interface voltage is first 1.8 V when the SIM card is inserted, and if the card does not response to the ATR a 3 V interface voltage is used.

MicroSD card interface

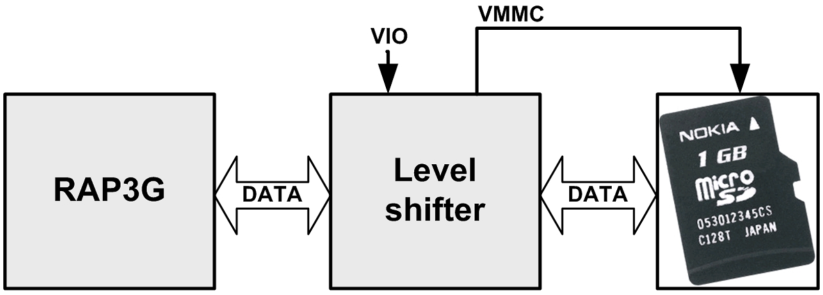

VIO
VMMC
RAP3G
DATA
Level shifter
DATA
NOKIA
1 GB
micro SD
053012345CS
C128T JAPAN

Figure 36 MicroSD card interface

The MicroSD card is connected to the engine by an external level shifter and ESD protection filter. Supplied voltages:

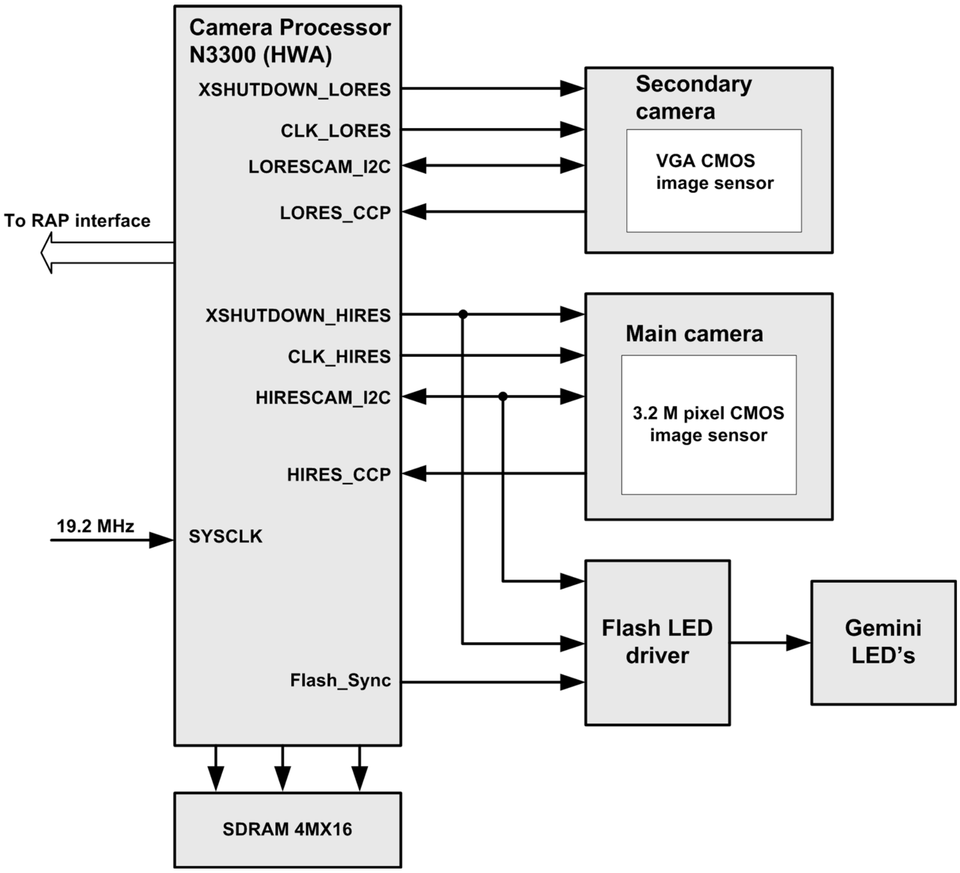
- VMMC: 2.85 V (from level shifter)
- VIO: 1.8 V (from AVILMA)

Camera concept

This phone has two cameras:

- A main 3.2 megapixel camera with 8x zoom and double LED flash.
- A secondary VGA camera used for video calls.

Both cameras are supported by a hardware accelerator (HWA Julie), which also handles the main camera flash function (LED diods).


Camera Processor N3300 (HWA)
XSHUTDOWN_LORES
CLK_LORES
LORESCAM_I2C
LORES_CCP
To RAP interface
XSHUTDOWN_HIRES
CLK_HIRES
HIRESCAM_I2C
HIRES_CCP
19.2 MHz
SYSCLK
Flash_Sync
Secondary camera
VGA CMOS image sensor
Main camera
3.2 M pixel CMOS image sensor
Flash LED driver
Gemini LED's
SDRAM 4MX16

User interface

Display module

Display module

The display in RM-414 is an active TFT QVGA display that supports up to 16.777.216 colors (320x240 pixels).

The interconnection between the LCD module and the engine is implemented with a 24-pin board-to-board connector.

Keyboard

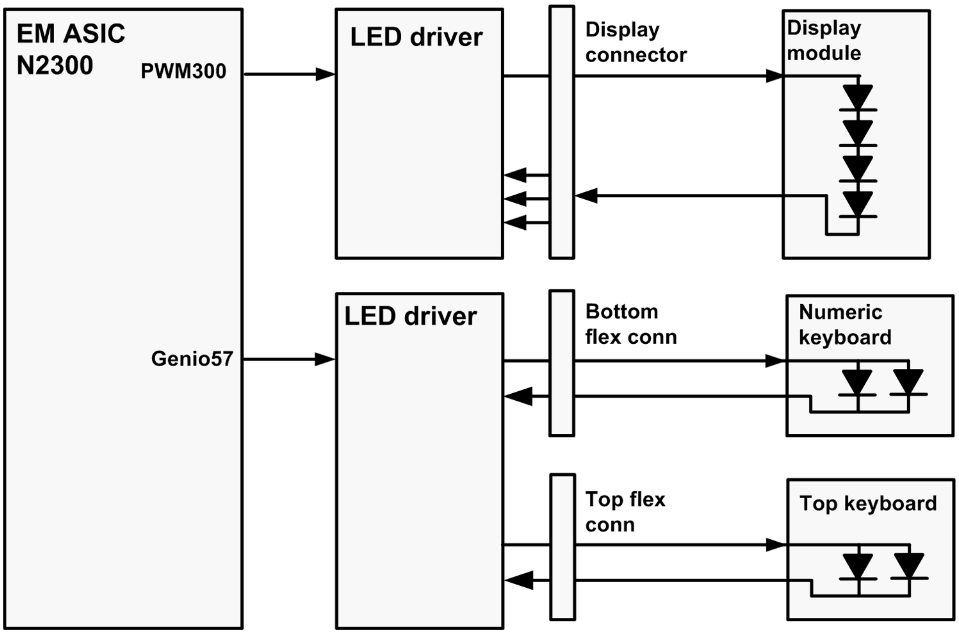
The keyboard is split into two parts. Numeric keys are located on the bottom side of the main PWB. 5-way navigation, send, end and soft keys are located on a flexible PWB in the upper block. All keys are connected to same keymatrix made up by the RAPIDO genios.

Backlight and illumination

There is backlight illuminating the display.

The lower/numeric keyboard is top lit by 2 LEDs, and the top keyboard is also lit by 2.

There is one driver for the display, and another for all keys.


EM ASIC
N2300
PWM300
Genio57
LED driver
LED driver
Display connector
Display module
Bottom flex conn
Numeric keyboard
Top flex conn
Top keyboard

Ambient light sensor (ALS)

The Ambient Light Sensor is used to control display and keyboard brightness with different light scenarios. This phone is using Greymon surface mountable ALS and it's located in the topflex. ALS is controlled by I2C. ALS has two channels. Channel 0 is for visible light and Channel 1 is IR light only. Those channels are calibrated in production but they can be calibrated also using Phoenix.

ALS consists of the following parts

- A lightguide (Part of A-cover)
- ALS component (N2502)
- Decoupling capacitor

Accelerometer

The accelerometer measures the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion or shock.

It has the following features:

- 2.16V to 3.6V supply voltage
- 1.8V compatible IOs
- low power consumption
- ±2g/±8g dynamically selectable scale
- embedded self test
- 10000g high shock survivability
- Pb free/RoHS compliancy

The accelerometer (N2501) is connected to I2C. One GENIO is reserved for interrupt.

Slide switch

This is a slide phone that wakes up when it slides open. It is implemented with two hall sensors mounted on the main PWB and a magnet fitted to the sliding mechanism. The hall detector output is active low (0V) and 1.8V when not active. This arrangement makes the phone able to detect closed and open position. The two hall sensors are overlapping each other to cover the entire sliding range.

■ Audio concept

The functional core of the audio hardware is built around EM ASIC N2200 and RAP.

N2200 provides an interface for the trancducers. Integrated hands free (IHF) stereo speakers are driven by D-class audio amplifiers.

There are three audio transducers:

- 1 digital microphone
- 1 earpiece
- 1 IHF (internal handsfree) speaker

N2200 also provides an output for the vibra motor.

Most headsets, or other external audio accessories, can only be connected via bluetooth.

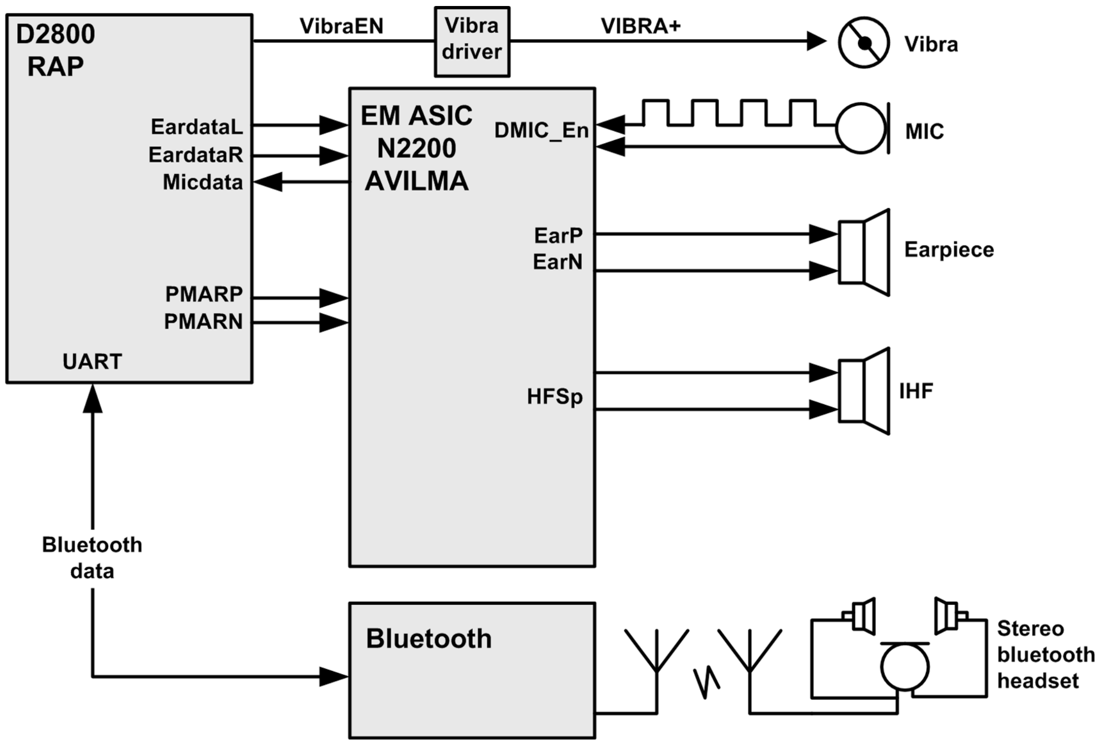

D2800
RAP
EardataL
EardataR
Micdata
PMARP
PMARN
UART
VibraEN
Vibra driver
VIBRA+
Vibra
EM ASIC
N2200
AVILMA
DMIC_En
MIC
EarP
EarN
Earpiece
HFSp
IHF
Bluetooth data
Bluetooth
Stereo bluetooth headset

Figure 37 Audio block diagram

Internal audio

The internal audio components are used in these modes:

	Hand portable (HP) mode	Internal hands free (IHF) mode
Microphone	X	X
Earpiece	X	
Speaker		X

Bluetooth

Bluetooth provides a fully digital link for communication between a master unit (the phone) and one or more slave units (e.g. a wireless headset). Data and control interface for a low power RF module is provided by the module.

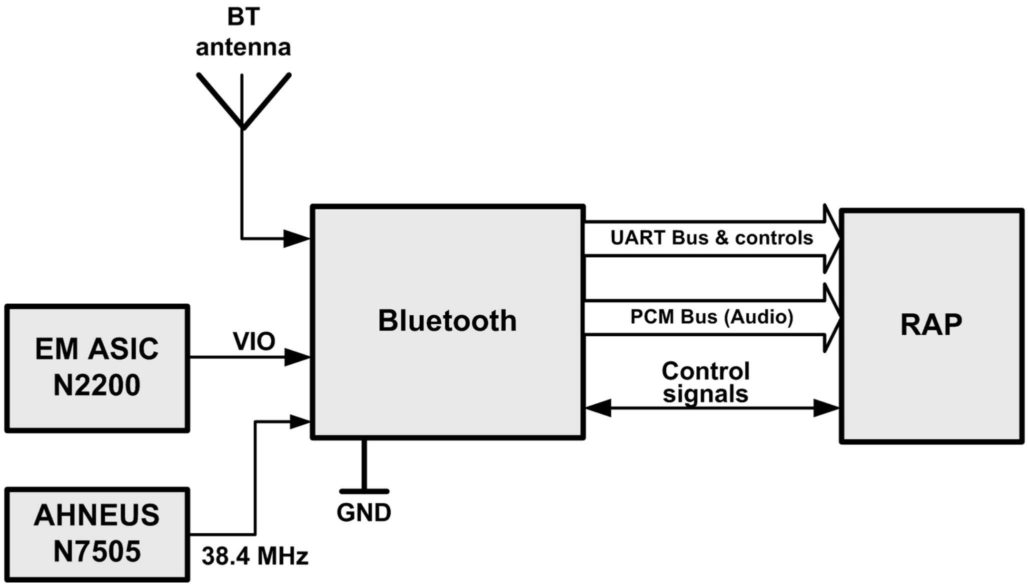

BT antenna
Bluetooth
UART Bus & controls
PCM Bus (Audio)
Control signals
RAP
EM ASIC N2200
VIO
AHNEUS N7505
38.4 MHz
GND

Figure 38 Bluetooth interface

The Bluetooth has a separate built in antenna and is powered by the regulated voltage VIO. For audio applications the Bluetooth has a PCM data bus. In addition a UART (universal asynchronous receiver/ transmitter) is used for data communication and controls.

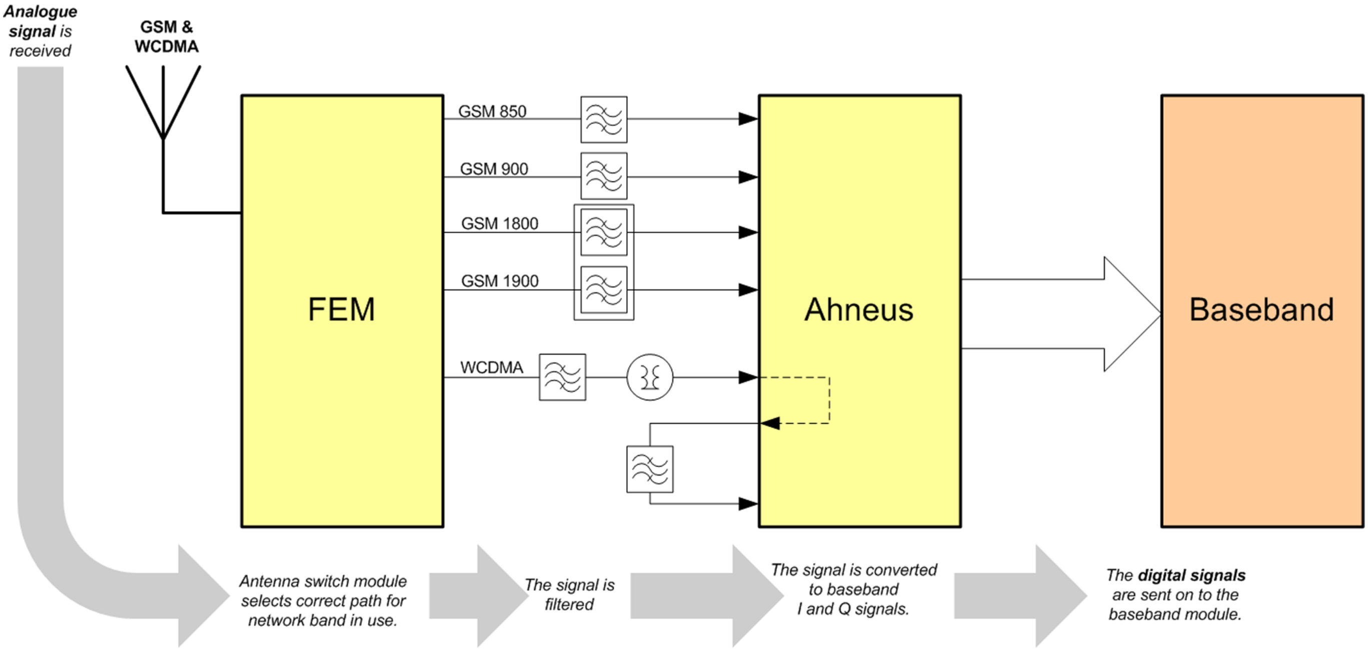
RF description

Receiver (RX)

An analogue signal is received by the phone's antenna. The signal is converted to a digital signal and is then transferred further to the baseband (eg. to the earpiece).

The receiver functions are implemented in the RF ASIC.

Signals with different frequencies take different paths, therefore being handled by different components. The principle of GSM and WCDMA is the same.

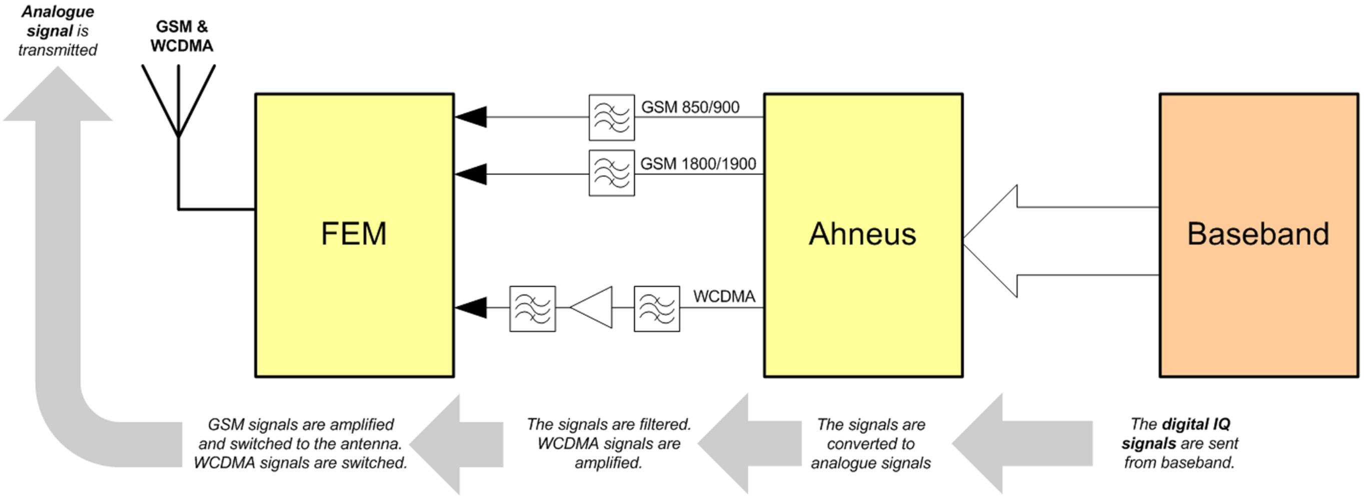

Analogue signal is received
GSM & WCDMA
FEM
GSM 850
GSM 900
GSM 1800
GSM 1900
WCDMA
Ahneus
Baseband
Antenna switch module selects correct path for network band in use.
The signal is filtered
The signal is converted to baseband I and Q signals.
The digital signals are sent on to the baseband module.

Transmitter (TX)

The digital baseband signal (eg. from the microphone) is converted to an analogue signal, which is then amplified and transmitted from the antenna. The frequency of this signal can be tuned to match the bandwith of the system in use (eg. GSM900).

The transmitter functions are implemented in the RF ASIC.

Even though the GSM and WCDMA signals are sent via different components, the principles of the transmission is the same.


Analogue signal is transmitted
GSM & WCDMA
FEM
GSM 850/900
GSM 1800/1900
WCDMA
Ahneus
Baseband
GSM signals are amplified and switched to the antenna. WCDMA signals are switched.
The signals are filtered. WCDMA signals are amplified.
The signals are converted to analogue signals
The **digital IQ signals** are sent from baseband.

Glossary

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A/D-converter	Analogue-to-digital converter
ACI	Accessory Control Interface
ADC	Analogue-to-digital converter
ADSP	Application DPS (expected to run high level tasks)
AGC	Automatic gain control (maintains volume)
ALS	Ambient light sensor
AMSL	After Market Service Leader
ARM	Advanced RISC Machines
ARPU	Average revenue per user (per month or per year)
ASIC	Application Specific Integrated Circuit
ASIP	Application Specific Interface Protector
B2B	Board to board, connector between PWB and UI board
BA	Board Assembly
BB	Baseband
BC02	Bluetooth module made by CSR
BIQUAD	Bi-quadratic (type of filter function)
BSI	Battery Size Indicator
BT	Bluetooth
CBus	MCU controlled serial bus connected to UPP_WD2, UEME and Zocus
CCP	Compact Camera Port
CDMA	Code division multiple access
CDSP	Cellular DSP (expected to run at low levels)
CLDC	Connected limited device configuration
CMOS	Complimentary metal-oxide semiconductor circuit (low power consumption)
COF	Chip on Foil
COG	Chip on Glass
CPU	Central Processing Unit
CSD	Circuit-switched data
CSR	Cambridge silicon radio
CSTN	Colour Super Twisted Nematic
CTSI	Clock Timing Sleep and interrupt block of Tiku
CW	Continuous wave
D/A-converter	Digital-to-analogue converter
DAC	Digital-to-analogue converter
DBI	Digital Battery Interface
DBus	DSP controlled serial bus connected between UPP_WD2 and Helgo

DCT-4	Digital Core Technology
DMA	Direct memory access
DP	Data Package
DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DTM	Dual Transfer Mode
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evolution
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GMSK	Gaussian Minimum Shift Keying
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HSDPA	High-speed downlink packet access
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HSCSD	High speed circuit switched data (data transmission connection faster than GSM)
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity
IR	Infrared

IrDA	Infrared Data Association
ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group
LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light-emitting diode
LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC, mic	Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
MTP	Multipoint-to-point connection
NFC	Near field communication
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architecture
OMAP	Operations, maintenance, and administration part
Opamp	Operational Amplifier
PA	Power amplifier
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x and BB5
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board
PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RF	Radio Frequency

RF PopPort™	Reduced function PopPort™ interface
RFBUS	Serial control Bus For RF
RSK	Right Soft Key
RS-MMC	Reduced size Multimedia Card
RSS	Web content Syndication Format
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)
RX	Radio Receiver
SARAM	Single Access RAM
SAW filter	Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noise ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCP/IP	Transmission control protocol/Internet protocol
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPnP	Universal Plug and Play
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC
USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator

VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator
VF	View Finder
Vp-p	Peak-to-peak voltage
VSIM	SIM voltage
WAP	Wireless application protocol
WCDMA	Wideband code division multiple access
WD	Watchdog
WLAN	Wireless local area network
XHTML	Extensible hypertext markup language
Zocus	Current sensor (used to monitor the current flow to and from the battery)

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